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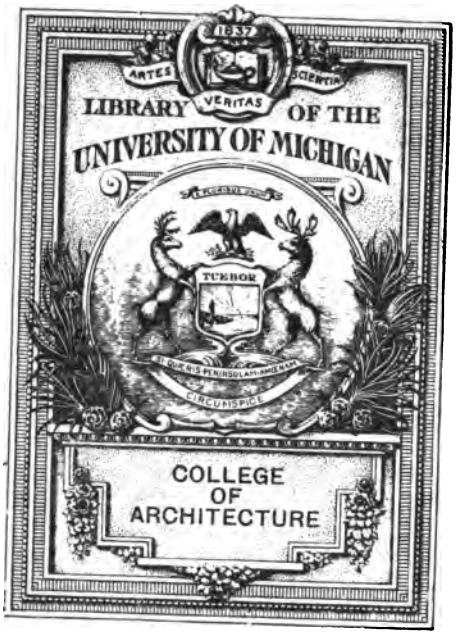
Tuberculosis Hospital and Sanatorium Construction

GARRINGTON

The National Association for the Study and Prevention of Tuberculosis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Adirondack Cottage Sanitarium, Trudeau, N. Y. THE ORIGINAL ONE-ROOM COTTAGE WHERE DR. EDWARD L. TRUDEAU BEGAN HIS EXPERIMENT WITH THE OPEN-AIR TREATMENT OF TUBERCULOSIS.

National tuberculosis association.

Tuberculosis Hospital and Sanatorium Construction

WRITTEN FOR
THE NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS

BY
THOMAS SPEES CARRINGTON, M.D.
ASSISTANT SECRETARY

NEW YORK
105 EAST TWENTY-SECOND STREET
1911

Preface

The present work is an expansion of the pamphlet issued two years ago by the National Association for the Study and Prevention of Tuberculosis in response to a pressing demand for information and advice in the establishment of sanatoria and hospitals.

During this period the emphasis of the campaign has been laid particularly upon the importance of increasing our equipment for the institutional care of tuberculous patients. The response has exceeded expectation and has been particularly encouraging in the degree to which local and state governments have accepted responsibility for the situation. Under these conditions the problem of tuberculosis from the institutional point of view is to care for the largest possible number of patients at the lowest possible cost compatible with efficient results.

While it is true that institutional expense is much more a matter of maintenance than of original cost of construction it is equally true that careful preliminary planning is the chief factor in subsequent economy of operation. It is with this end in view that the following study has been prepared.

It is hoped that the book will prove of service to those charged with the responsibility of dealing with the institutional problem in their several communities.

LIVINGSTON FARRAND,
Executive Secretary.

May 15th, 1911

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Introduction

It is hoped that this work will be found useful by those who desire to design and construct hospital and sanatorium buildings for the care of tuberculous patients.

The information presented has been collected during a series of investigations into the methods and materials used in the construction of buildings at various institutions where patients are treated for all varieties and stages of tuberculous disease. This book is a development and expansion of the original pamphlet on construction, "Some Plans and Suggestions for Housing Consumptives," published in 1909 by the National Association for the Study and Prevention of Tuberculosis, and includes the results of studies made on the question of sites, in order to determine in some degree the effect of location and surroundings from both the clinical and economic points of view. During the past two years, in a number of states, legislation has been enacted authorizing counties to establish institutions for the treatment of tuberculous patients. The rapid growth of this movement has brought about many new problems in the construction and maintenance of hospitals and sanatoria, and it has been the aim to embody in this work such material as might help in the solution of these difficulties.

Cost of Construction

It is the opinion of the majority of those who have had experience in constructing and administering tuberculosis hospitals and sanatoria, that it is wise to build in a comparatively inexpensive manner. Excellent results have been obtained by the open-air method of treating tuberculous patients in institutions built on simple and economical plans; and further, this class of institutions returns patients to their homes without making them unduly discontented with the environment and life to which they belong. It may therefore be said that those who adhere to simplicity and economy in sanatorium construction and furnishing, and who supply patients with good wholesome food, cleanliness, light employment, and a happy, friendly atmosphere, are operating along modern and approved lines.

One of the first questions asked when the establishment of either a sanatorium for incipient cases or a hospital for advanced cases is proposed in a community, is, "What funds will be needed for constructing and maintaining the institution?" In general terms it may be stated:

A Sanatorium for Incipient Cases, having a capacity of fifty patients, will cost to build and equip (exclusive of the land) $25,000 and upward.

A Hospital for Advanced Cases, having a capacity of fifty patients, will cost to build and equip (exclusive of land) $50,000 and upward.

A Hospital for Both Classes of Cases, having a capacity of fifty patients, will cost to build and equip (exclusive of land) $35,000 and upward.

In other words, it will cost to build and equip a complete institution for Incipient Cases about $500 per bed; for Advanced Cases $1,000 per bed; and for Both Classes of Cases in the same institution $750 per bed.

Cost of Administration Buildings

Administration buildings for an institution housing fifty patients can be constructed for $12,000 and upward, the cost depending upon the material used and the exterior and interior finish.

Cost of Infirmaries and Pavilions for Advanced Cases

Infirmaries and pavilions for advanced cases, having a capacity of twenty patients, housed in single rooms, can be constructed for $10,000 and upward.

Cost of Lean-tos

Lean-tos having a capacity of sixteen incipient cases can be constructed for $800 and upward.

Examples of Appropriations

The following list is given in order to show how, in an actual case, $100,000 was expended for the construction of a State Sanatorium housing one hundred and fifty patients of all classes except the very far advanced cases.

Administration Building	$31,500
Four Lean-tos (each $3,500)	14,000
Two Wards for Advanced Cases (each $7,000)	14,000
Power House and Heating Plant	5,000
Sewage Disposal Plant	2,000
Water Pumping and Supply Plant	5,000
Boilers and Machinery	3,300
Furnishings	7,000
Laundry	1,200
Land (Site)	5,500
Expenses of Building Commission	11,500
Total	$100,000

The following is cited in order to show the distribution of an appropriation for the construction of a County Hospital having a capacity for fifty patients, of all classes.

Site, Water Supply and Sewage Disposal	$10,000
Administration Building	16,000
Advanced Case Pavilion (Twenty Beds)	10,000
Two Incipient Case Pavilions ($2,500 each)	5,000
Total	$41,000

Arrangement of the Floor Plans for Administration Buildings

Many Administration Buildings constructed for Tuberculosis Hospitals or Sanatoria have been designed on general hospital lines. This has not proven to be the most satisfactory type of building for administrative purposes, as the medical staff, nurses and servants are often arrested or cured cases of tuberculosis. Administration buildings that seem best adapted for institutions of this class, are those constructed so that all persons housed in them may have, if desired, individual open-air sleeping porches. For this reason, it is the opinion of many authorities that all buildings for tuberculosis institutions should be of the open type; that is to say, with walls pierced by as many windows reaching from the floors to the ceiling as possible, and all apartments arranged so that they may be thrown

open on at least two sides. Amusement halls, reading, dining and sitting rooms, which are constructed as small individual buildings, and arranged to be opened on all sides when the weather permits, are being erected in greater numbers, and prove satisfactory. Buildings used by the administrative departments, except in cities or towns where land is valuable, are said to give better service when entirely separated from the patients' quarters. Where sites are large enough, one-story buildings, even for administrative purposes, are becoming popular.

Arrangement of Floor Plans for Pavilions for Advanced Cases

Pavilions for advanced tuberculous cases have also, in the past, been constructed in the same manner as general hospital wards, but as it has been found that many advanced tuberculous patients, with proper care, quickly improve under the open-air treatment, these buildings are now being planned so that open porch space may be allotted to all the inmates, and individual rooms provided for all far advanced cases.

Arrangement of Floor Plans for Lean-tos

The only changes of importance, during the past months, made in designing the lean-to type of building, have been in the provision of larger lockers for each patient, and in placing transverse partitions on the open sleeping porches in order to house the patients in smaller groups. It may be said that practically all new designs call for lockers which are large enough to be used as private dressing rooms, and in many instances fitted with a chest of drawers, a mirror, racks for toilet articles, and other conveniences.

Transportation

The importance of keeping down the cost of maintaining an institution after it is erected, should be always before those selecting the site and planning the buildings. Transportation expense is one of the larger factors in this problem, and it is becoming clearer that public institutions must be placed on or near good transportation facilities. In a number of instances, railroad companies have willingly put in spurs or sidings free of charge, as the sites chosen were near their right-of-way, and it is advisable that authorities, considering the establishment of a sanatorium or hospital, consider this question with care before purchasing an otherwise desirable property.

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SECTION I
Site and Grouping

SECTION I

Site and Grouping

Sanatorium Sites

In selecting a site in the open country for a tuberculosis sanatorium, to house incipient and moderately advanced cases, a decision must be made as to whether the advantage of having the patients near at hand and accessible to their friends overweighs the possible benefit to be obtained by placing the institution in a region more favorable from a climatic point of view, but far from the patients' homes. It is now generally agreed that in the treatment of tuberculosis excellent results can be obtained in practically any section of the country and the desirability of local institutional provision can be accepted as an established fact. Within a short distance of almost every city and town, land can be obtained where tuberculous patients will do well.

Transportation Facilities

Transportation facilities should always be carefully considered, as a long haul from the railroad or landing adds expense both in building and maintenance. Probably in the near future most of the institutions founded with the intention of housing over one hundred patients, will be placed upon land that can be reached without great expense by a private branch or spur from the nearest railroad, or by some other means of public transportation. A site on a direct trolley line is very desirable in order to make it accessible to the patients' friends. It is often hard to hold consumptives in a sanatorium, for the very sick do not like to leave their families, and many incipient patients become restless when first compelled to drop their regular occupations. If a sanatorium is close to the towns from which most of the patients are drawn and where by a short trolley trip visitors can reach it easily, the location will help very largely in making the patients contented.

Extent and Nature of the Land

The site should be a tract of land from twenty to two hundred acres in extent and it will be more valuable for its purpose if it includes forest, orchard and land that can be cultivated. It is now generally conceded that incipient patients improve faster when they are supplied with work under careful supervision, and at many sanatoria, if directed by an efficient medical superintendent, they will be able to do a considerable part of the farm work with real benefit to themselves and a reduction in the cost of their maintenance. When there is a choice of a number of sites, a damp or swampy location should be avoided, as such land when selected must be drained. The expense of preparing some land is very great, while the natural advantages of another property may be such that a large outlay for improvement is not necessary. For these reasons it is advisable to have a thorough examination of possible land made before it is chosen as a site for a sanatorium.

Lighting, Water and Sewage

A good supply of water is a necessity, and for this reason when building near a city it is well, if possible, to secure property within the line of the city water supply and sewer systems, thus settling the question of water, sewage disposal and lights. On all other land considered there should be good springs, a running stream of clear water, or the possibility of obtaining it by driving a thoroughly protected well. The disposal of sewage must also be considered before the land is acquired, as the quality of the soil, the rise of the land and the position of water courses and lakes enter into the question and increase or reduce the cost of installation and maintenance. These subjects are all considered more in detail under the section on administration buildings.

Meteorological Conditions

It is very important that the meteorological conditions of a prospective site should be known. This means obtaining data with regard to the altitude, average humidity, number of stormy days in the year, highest and lowest degrees of heat and cold, prevailing winds and any atmospheric peculiarities which might affect either the patients or building materials. It is well to remember that vastly differing conditions are often found within a radius of a few miles; therefore, such information should be gathered on the site itself. Land where strong winds prevail during certain seasons of the year and where heavy frosts occur more frequently during the winters than in other nearby localities should be avoided if possible. Usually the southern exposure of a hill or mountain is to be preferred.

Natural Beauty

The problem of holding tuberculous patients at sanatoria grows more serious each year, and as the institutional care of certain classes of cases seems to be an absolute necessity in order to control the disease, every effort should be made to place patients upon sites that have natural attractions which will help to amuse and make them contented. The open country, where a sanatorium for incipient cases is generally placed, usually offers a choice of sites some of which may have great natural beauty. In making a decision from several pieces of property offered, this should be considered as a valuable asset. A sloping, rolling or hilly piece of land is more desirable than a level one. Mountains, hills, meadows and trees add to the beauty of the view, and a forest, lake or stream gives opportunities for amusement. A great deal can be done by artificially improving the grounds where there is a lack of natural beauty, and in the selection of a site in a bare or flat country this should be planned for.

Examination of Land

The following questions used by the National Association for the Study and Prevention of Tuberculosis when asking for information needed by its Bureau of Hospital and Sanatorium Construction, may be of some assistance to those examining a property for the purpose of determining its value as a site for hospital and sanatorium purposes.

1. How many acres of land are available for Sanatorium purposes?
2. Is the ground flat, rolling, or on a hillside?
3. What is the degree and exposure of the slope of the hills?
4. Are there trees for protection from prevailing winds?
5. What is the direction of the prevailing winds in summer? In winter?
6. What is the altitude above sea level and above surrounding country?
7. What is the amount of moisture precipitation per year?

No. 1.—Loomis Sanatorium, Liberty, N. Y. VIEWS OF A FARM-HOUSE BEFORE AND AFTER REMODELING. NOTE THE WIDE SLEEPING PORCHES CONSTRUCTED ON THE FRONT OF THE BUILDING IN THE LOWER ILLUSTRATION. (See illustrations 72, 73, 91 and 108 for further description of this institution.)

8. What is the average amount and duration of snow?
9. What is the highest and lowest recorded temperature?
10. What is the mean temperature of the winter months?
11. What is the mean temperature of the summer months?
12. Is it possible to use the local water supply of the nearest town?
13. At what height on the property above or below the building site is the water supply?
14. What is the amount of water flow in gallons per minute?
15. What is the direction and size of the water courses on the property?
16. What are the lighting facilities in the neighborhood, gas, electricity, etc.?
17. What is the composition of the soil?
18. What building materials are available on or near the property? Can sand, building stone, rough stone for foundation, brick, cement, lime and timber be easily obtained?
19. What are the transportation facilities, such as railroad, trolley lines, etc.?
20. Where is the principal approach to the proposed site?
21. What is the distance from the nearest saw and planing mill?
22. Are there any old buildings on the site? (Give full description with a drawing of the floor plans and photographs of the front and side elevation.)

NOTE: Sketch-map of proposed property showing location of buildings, entrances, water-courses, etc., is very desirable.

Farm Buildings

Often farm-houses or other structures stand on the land chosen and can be remodeled so as to make useful sanatorium buildings. The expense of constructing the institution may be materially reduced if these are good, substantial structures, but they should be examined carefully and unsanitary conditions corrected, especially if the buildings are damp at any season of the year. Careful inspection of the plumbing, drains, and cellar should always be made by an experienced sanitarian. When the walls of the cellars are damp, some method should be used to obtain a circulation of air about the foundation. This can be done by a trench opened on the outside of the house, and a new wall built beside the old foundation, leaving an air space between the two walls. The cellar floor should then be relaid with a foundation of broken stone, covered with cement, and openings made in the cellar walls to procure plenty of light and air. The greatest care must be used to prevent dampness around all old buildings; in some places a subsoil system of drainage will be needed, while in others it may be necessary to remove trees close to the house.

In all rooms, where there is sufficient wall space, new windows should be made, and old windows cut down to the floor and up to the ceiling. Ventilation for the winter months may be obtained by building fireplaces or installing ventilating flues, and other appliances used to give a continuous change of air. Often it will be necessary to install baths and toilets and have connections made with the water supply and sewage disposal plants.

Many old farm-houses are built of heavy timbers which are usually well preserved and can be repaired and put in excellent condition without great expense. When planning a rearrangement of an old building for administration purposes, a large dining room is usually the most important apartment to be provided, and often can be made by removing the partitions between rooms on the ground floor and throwing two or three together. Many institutions have been started by housing the administrative department in old buildings which were only large enough for a kitchen, dining room and office on the first floor, and a few rooms for the staff on the second. A small hospital started in this way may provide for a large number of patients.

An old country mansion will often make a good administration centre for a small,

No. 2.—The Natural Features of the Land shown in These Views Greatly Add to the Value of Property for Sanatorium Sites. THE GROUP OF BUILDINGS IN THE UPPER ILLUSTRATION IS THE BARLOW SANATORIUM. (See a description of the cottages on page 159.)

private sanatorium, in many cases without remodeling. Small cottages of the Mille type (Illustration 96), or those of the Open air Sanatorium, Oregon (Illustration 107), cai then be built about the grounds for a comparatively small outlay.

The barns and out-buildings if in good condition will also save a considerable outlay for they can be used for housing cows, chickens and other domestic animals which shoul be counted on to reduce the cost of maintenance.

Grouping

There is a constant call for information as to the best methods of arranging building on the sites for new institutions in order that the plants when completed can be run withou undue waste of funds or energy. It is to be remembered that the economical operation o a hospital or sanatorium after it is finished and filled with patients, is of much more im portance than the initial cost of construction. Many existing sanatoria of large size wer started in a small way, additions being made in a haphazard manner as necessity required and very little planning done except for administration buildings, power houses and patients quarters, before the construction of the plant was commenced. It is also a fact that th superintendents of a number of new institutions have found after their plant was supposed to be ready for good work, that large additions to their buildings were necessary to reduc the cost of maintenance to a defensible figure. In order to overcome this difficulty in th future, for projected institutions, a general block plan of the site should be made before con struction is started. This is particularly true for public institutions depending for thei support upon the good will of the community which they are to serve, as it will greatly hel in producing a symmetrical whole and avoid waste in maintaining the plant when completed In planning a new hospital or sanatorium the object should be to house the patients in way that will provide as much comfort as possible. The size of the site and the block pla of the grounds depend upon the number of buildings to be erected and the manner in whic the completed institution is to be administered.

Grounds

For a sanatorium having a capacity of about one hundred patients situated in th open country, a site should consist of about two hundred acres of land, to be apportione somewhat in the following manner.

20 to 40 acres for sanatorium buildings, amusements, park, forest and lake.
10 to 20 acres for farm buildings and the care of domestic animals.
20 to 30 acres for a vegetable garden and potatoes.
10 to 20 acres for an orchard and small fruits.
20 to 30 acres for corn fodder.
60 to 80 acres for pasture or grain.

Usually a part of the site must be cleared and laid out as a park, with walks an drives, while roads and cement or gravel paths with water mains beside them and fire plug at suitable points are required near and between the buildings. For such improvements o the grounds from $2,000 to $10,000 should be appropriated.

Railroad Station

Where a site is situated beside or near a railroad, or an interurban trolley system, th institution should have a station, and in sparsely settled parts of the country the transporta tion company may be willing to construct it for the sanatorium. The building may be

one story frame or brick structure 15 feet wide by 30 feet long, divided into one large room 15 by 15 feet, and two small rooms 7½ feet wide by 15 feet long, and having at one end a covered freight shed 10 feet wide by 20 feet long. When the right-of-way is near the sanatorium buildings the station can be used to house the post-office, telephone exchange, express office and a store for the convenience of the patients who often wish to purchase material for personal use.

It is said to be an advantage to a transportation company to obtain the location of a sanatorium near its right-of-way and in many sparsely settled sections of the country the company may be willing to give the land for the institution's site. The sanatorium has a great educational value; it gives employment to local people; it has a pay-roll of from $1,000 to $1,500 per month, a part of which, at least, is expended in the neighborhood; it brings friends and visitors to nearby hotels, benefits the merchants, and creates a market for produce raised in the vicinity.

Buildings and Improvements for Block Plan

The following is a list of the buildings and improvements to be considered by the architect when laying out the site.

Administration Building.
Service Building.
Patients' Pavilions.
Amusement Pavilion.
Power House (Heating, Lighting and Water-supply).
Laundry and Sterilizing Room.
Industrial Shop.
Ice-house or Cold Storage.
Railroad Station, Post-office, and Telephone Exchange.
Carpenter and Paint Shop.
Store-house, Scale-house and Bakery.
Green-house.
Two hundred feet of Cold Frames or Forcing Beds.
Vegetable Cellar.
Garage.
Barn for Horses.
Barn for Cows.
Silo.
Milk House.
Colony Chicken Houses.
Hog House.
Sewage Disposal Plant.

Sites for Hospitals to House Advanced Cases

The choosing of a site and the grouping of the buildings of a hospital for far advanced cases usually presents an entirely different problem from that involved when founding a sanatorium for incipient cases. It is usually desirable to provide for the advanced patient in or near the town from which he comes, and therefore the choice of a site is largely governed by the cost of the land and the attitude of the surrounding property owners.

A hospital for this purpose should not be placed in a quarter where noise, the smoke from factories or the dust from uncared-for streets will affect the patients. Otherwise, almost any site is suitable which can be easily reached, and is large enough to allow for the construction of porches on the buildings. These questions are considered more in detail in Section III, Administration Buildings and Patients' Quarters Combined.

EXAMPLES OF GROUPING AND SITES

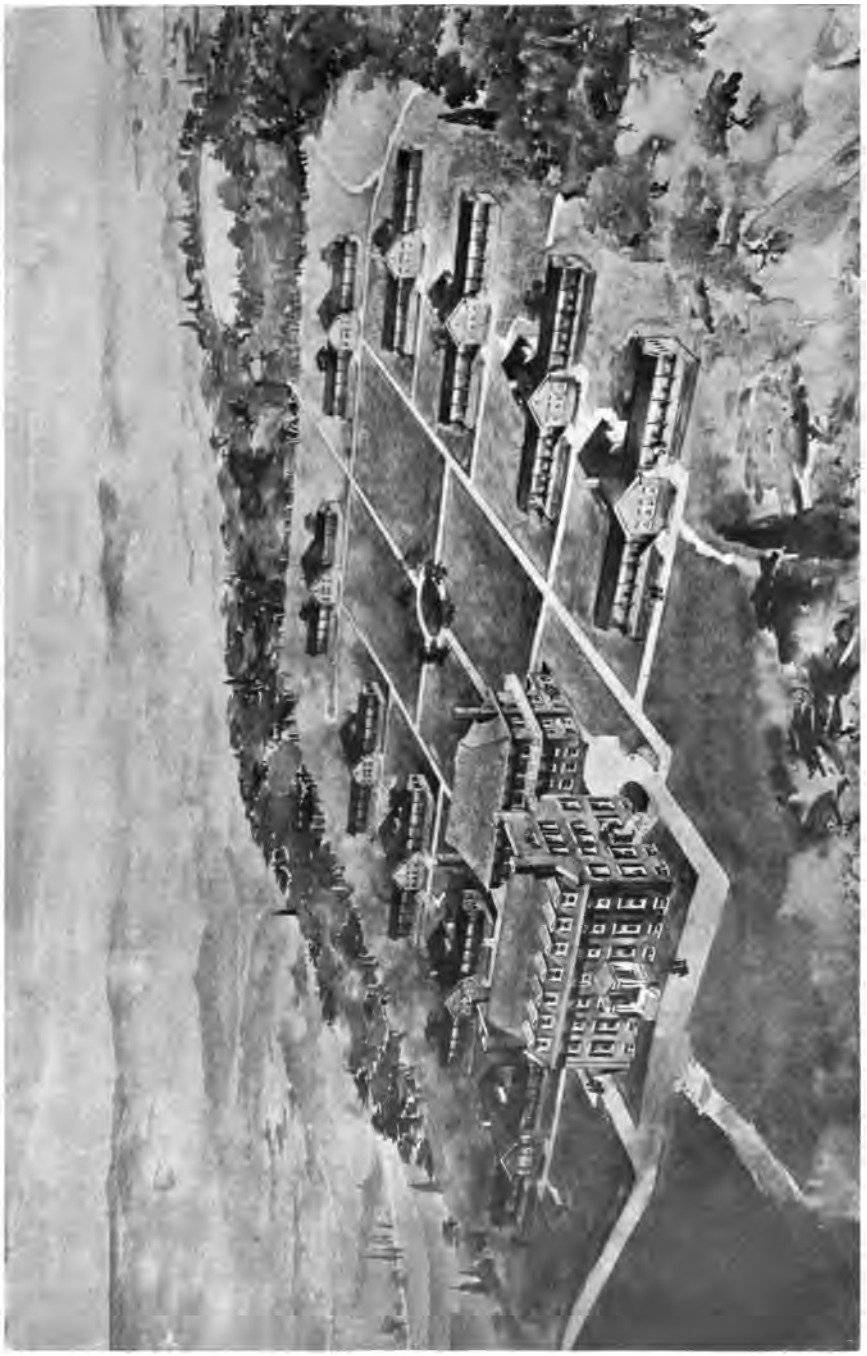
The following institutions are good examples of various methods of grouping buildings and laying out sites.

The Maryland State Sanatorium, Sabillasville, Md. (Illustration 3.) This is a well chosen site for a state institution, situated near the top of one of the mountains of the Blue Ridge range, sixty-seven miles from Baltimore on the Western Maryland Railroad. The sanatorium owns the station and has placed its power house on a siding close to the railroad in order to run coal cars directly over the storage bins. The building site is reached from the power house and railroad station by a well graded macadamized road twenty feet wide and a quarter of a mile long, which ascends gradually through a beautiful woodland. The buildings have been placed on a comparatively flat piece of land lying on the south side of the mountain, with a beautiful view of the valley. Behind them the ground rises for about four hundred yards, protecting the site from the north winds. At the top of this ridge is a concrete reservoir, having a capacity of seventy thousand gallons and supplied with water by pumps in the power house. The buildings are grouped together as shown in the illustration because of the topographical features of the land. The Administration Building stands in front and is connected by a corridor with the Service Building directly in its rear. The sleeping shacks are arranged in two rows on both sides and to the rear of the main buildings and the slope of the ground allows a good view of the valley and mountain from their porches which overcomes the objection of placing the front of one shack directly in the rear of another. The capacity of the plant is two hundred patients at an estimated cost of $150,000.

The Georgia State Sanatorium, Alto, Ga. (Illustration 4.) This site is a tract of land comprising two hundred and fifty-seven acres, located on the main line of the Southern Railway, two miles from Alto and seventy-four miles southeast of Atlanta, with a station about a quarter of a mile from the institution. The elevation is about sixteen hundred feet above sea level in a part of the country comparatively free from dust and where the air is said to be pure and invigorating the year round. The land has a general slope to the southeast and is fairly well protected on the north and west by a rising hill and forest growth.

The problem to be solved by the architects in arranging the block plan was to care for seventy-five white patients at the present time and prepare for a future growth of the institution to three hundred and fifty or four hundred white and colored charity cases of both sexes. The plan illustrated was adopted because of certain peculiarities in the contour of the land, which lies in the form of a horseshoe made by a flat with two promontories jutting out from it on the same level. Between the promontories is a ravine forming the main axis of the block plan. The Administration Building is located on the flat, directly at the head of the ravine at the north of all the patients' quarters, which are arranged on the two promontories. This plan worked out so well that one contour line runs through seventy-five per cent. of the buildings, adding greatly to ease of administration, as a level path will connect them. Practically everything on the grounds can be seen from the administration building, as the other structures were arranged with that idea in view.

Nearest the entrance to the west is the Reception Hospital, where all early cases will be housed for observation on their arrival. To the left and front of this is the library.



No. 3.—Maryland Tuberculosis Sanatorium, Sabillasville, Md. WYATT & NOLTING, ARCHITECTS. BIRD'S-EYE VIEW SHOWING METHOD OF GROUPING LEAN-TOS IN REAR OF ADMINISTRATION BUILDING. NOTE THE POSITION OF THE SITE ON A SOUTHERN SLOPE OF A MOUNTAIN, WITH A RESERVOIR ABOVE AND AT THE REAR OF THE LEAN-TOS. CAPACITY, 200 PATIENTS. ESTIMATED COST, $150,000. (See illustrations 64 and 75 for further description of this institution.)

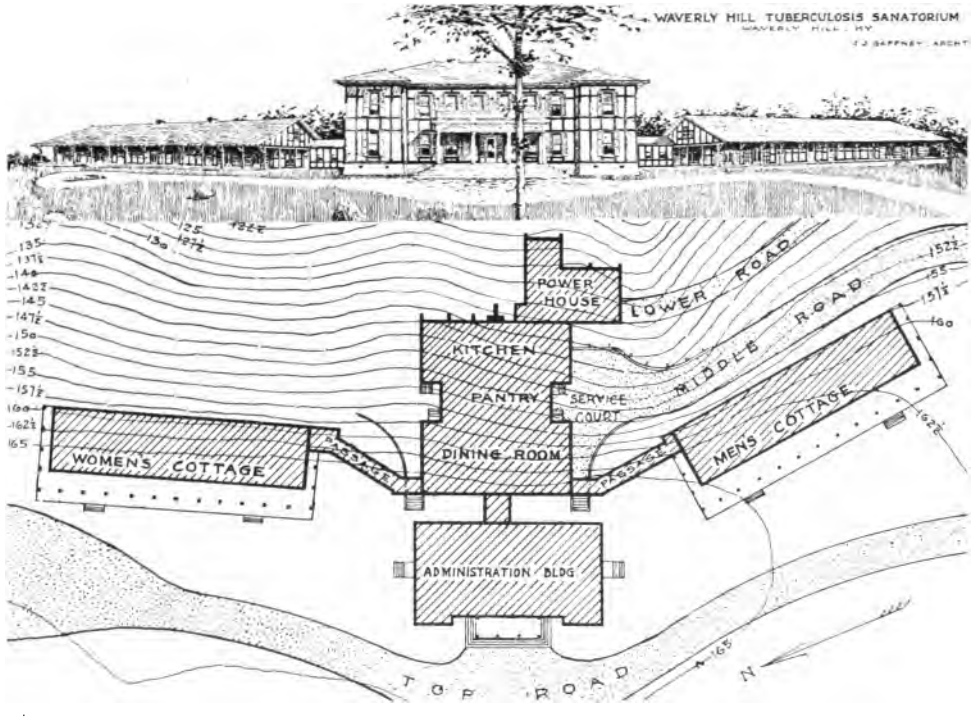
No. 4.—Georgia State Sanatorium, Alto, Ga. Scopes & Feustmann, and Walter W. Judell, Associated Architects. Block Plan Showing the Contour Lines and the Method of Grouping the Lean-tos on Two Promontories in Front of the Administration Building. Note the Negro Quarters on the Left of the Illustration in the Foreground. Capacity to be 400 Patients. Estimated Cost, $175,000. (See illustrations 65 and 78 for further description of this institution.)

To the east or on the right of the illustration is the infirmary, now in use as a temporary administration building, and still east of this is the dining room and the service building. In front of these main buildings on both slopes of the promontories are arranged the shacks for white patients (with floor plans adopted from the King type of lean-to at the Loomis Sanatorium) twenty-four in all, having a capacity of ten patients each. Back of the main entrance drive near the road to the station are the stables. On the south and east of the service building but on a lower level is the women's work-shop, and back of the administration building are two cottages for the superintendent's family and physicians' residence. Still further to the rear and slightly to the east are a number of small cottages to be used as temporary quarters for the nurses or other members of the staff. A service building similar in plan to the infirmary for the white patients will serve the negro quarters which are to be practically the same as those provided for the white patients, but entirely separated from them and concealed by a thick growth of trees and shrubbery. All the buildings are grouped among the pines on the southern slope of one of the hills, well protected from the winds and with a pleasing outlook from the porches. About fifty feet below these buildings in a ravine is a stream fed by a spring alongside of which is placed the pump house. This is connected with an elevated tank for the storage of water, located on the highest point of the site to the rear of the stables. There is a good supply of water, large enough, by constructing a dam, to furnish power for the institution. A farm and dairy are contemplated, for which there is ample land. This block plan is intended to show the institution as it will be when completed, and the estimated cost, including power plant, water supply and sewage disposal for four hundred patients, was $175,000, divided among the different buildings as follows:

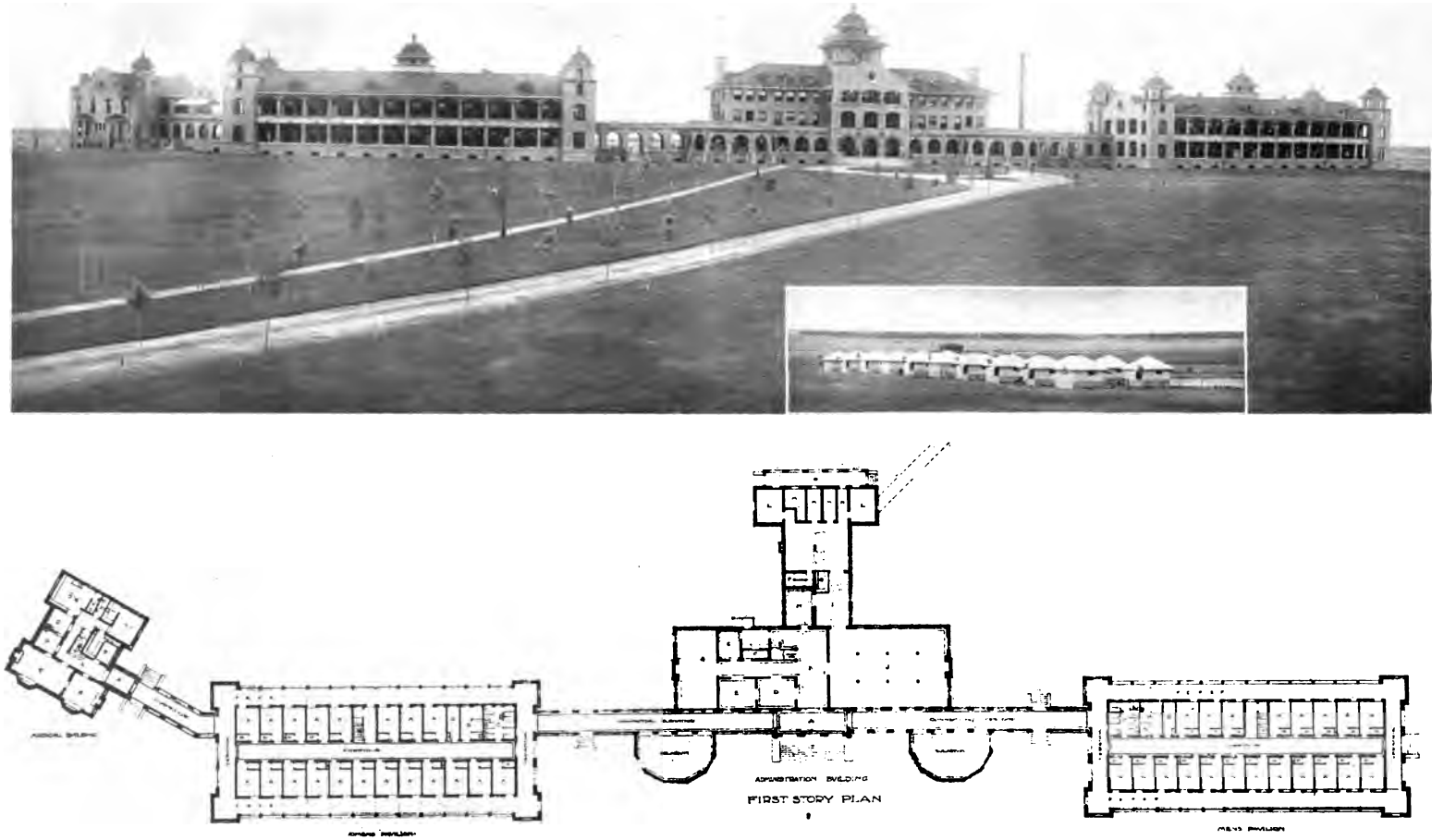
Administration Building	$12,000	Library	$3,000
Infirmary	15,000	Recreation Building	3,000
Reception Building	15,000	Superintendent's Cottage	3,500
Service Building	15,000	Doctors' Cottage	3,500
32 shacks at $1,800 each	57,600	Stable	5,000
2 work-shops, $4,000 each	8,000	Negro Infirmary	15,000

Waverly Hill Tuberculosis Sanatorium, Louisville, Ky. (Illustration 5.) The Waverly Hill site includes one hundred and seventy acres of land, situated on a range of hills near Iroquois Park and overlooking the Ohio River and a magnificent stretch of country.

The buildings are erected on concrete foundations with walls of frame construction, covered on the outside with stucco, treated in bright and contrasting colors. The roofs are covered with red tile and the whole makes an interesting block of sanatorium buildings grouped closely together. The administration building, which is two stories high, stands alone in the foreground, its side and rear windows overlooking the patients' quarters. The steep side of a hill in the rear of the service building has been used to advantage in arranging its position and the relation of the power house to the entire plant. The sanatorium conducts a farm, dairy herd, and poultry in order to give the patients pure, fresh food and an opportunity for light exercise by work in the open air. The capacity of the plant is forty patients and the cost $100,000.

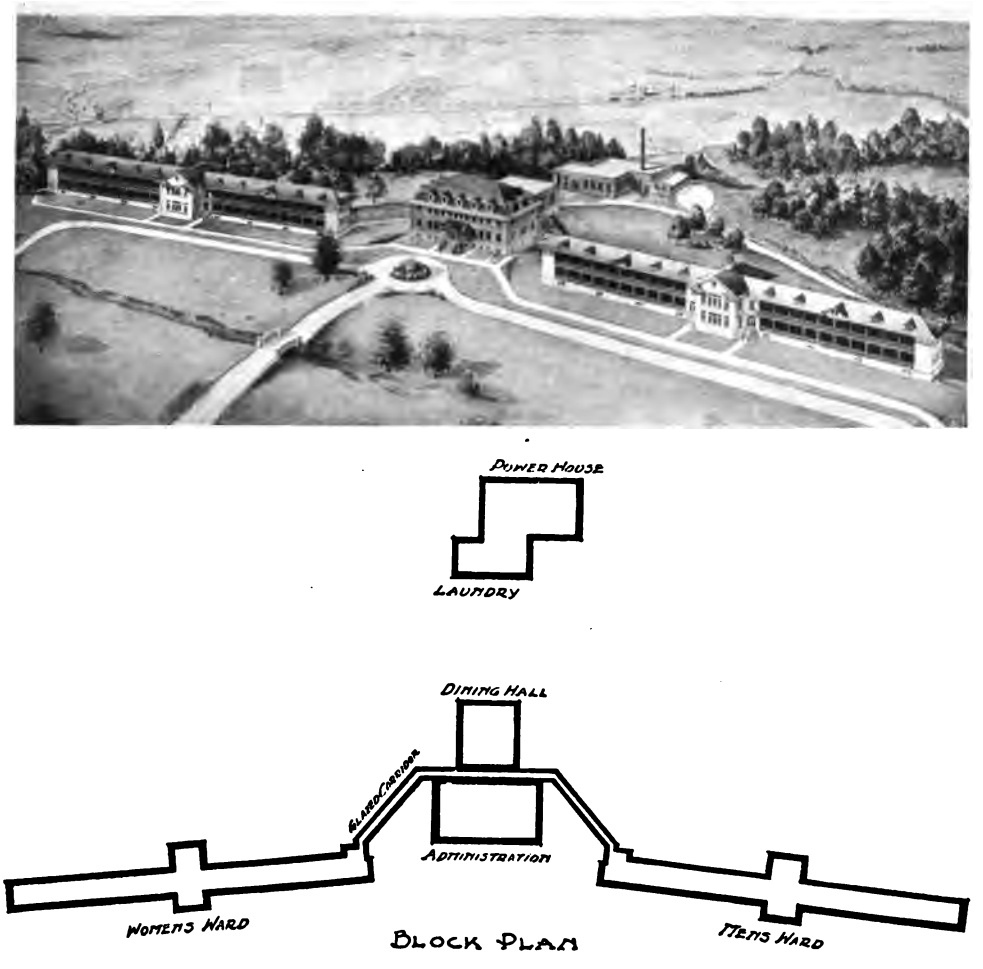


No. 5.—Waverly Hill Sanatorium, Waverly Hill, Ky. J. J. Gaffney, Architect. Front Elevation and Block Plan Showing Contour Lines and Method of Grouping Buildings on the Edge of a Hill with a Steep Slope at the Rear. Note Back View of Plant, Illustration No. 18. Capacity, 40 Patients. Estimated Cost, $100,000.



No. 6.—Agnes Memorial Sanatorium, Denver, Colo. Gove & Walsh, Architects. View of Front Elevation and Block Plan Showing Method of Grouping Buildings Along a Common Front. Original Capacity for 40 Patients. Estimated Cost, $250 000. Present Capacity, 150 Patients.

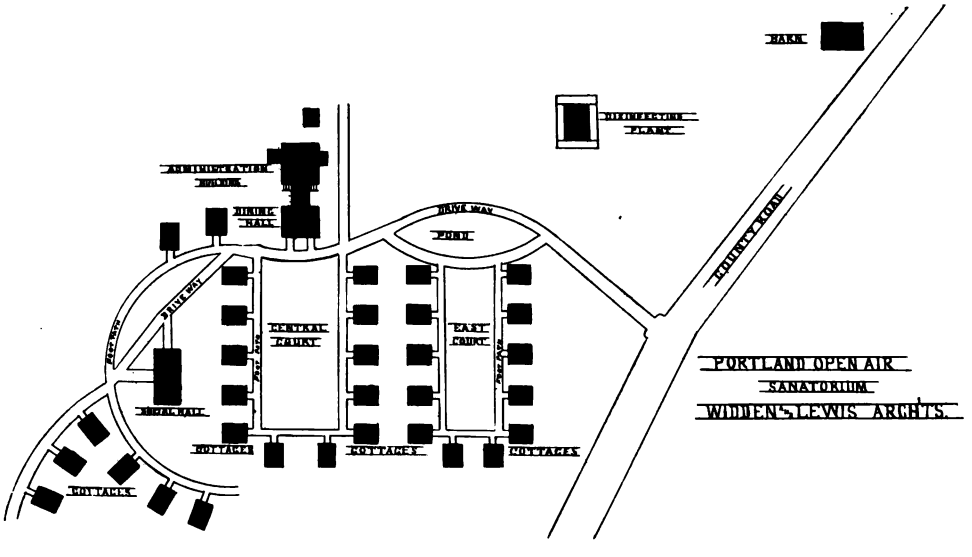
Agnes Memorial Sanatorium, Denver, Colo. (Illustration 6.) This institution when first constructed, consisted of an administration building, two pavilions and a medical building. The floor plans were outlined by Dr. G. Walter Holden and adapted to the Spanish style of architecture. The pavilions are two stories high with porches around the entire structures on both floors. Every patient is housed in a separate bedroom 11 feet wide by 13 feet long, containing a radiator, a ventilating register and a closet 3 by 5 feet. These rooms open on to a central corridor at one end and at the other upon a veranda space 11 feet 4 inches wide by 8 feet deep. This can be curtained off by sliding curtains, in order to make the space private when desired. The roofs of the porches are raised to a height that will allow sunlight to penetrate into each room at some time during the day. It has a capacity for forty patients, and cost $250,000, and was equipped for $50,000 additional.



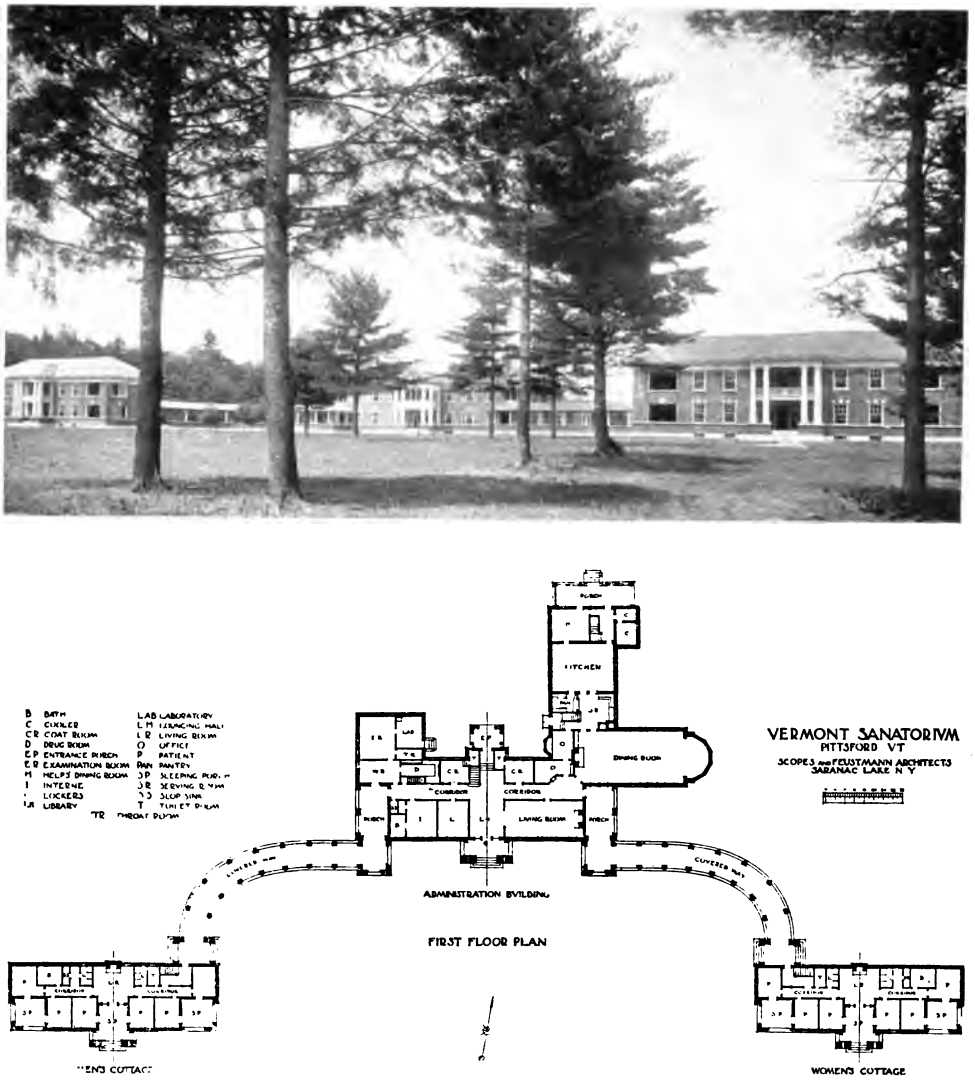
No. 7.—Indiana State Hospital, Rockville, Ind. BRUBAKER AND STERN, ARCHITECTS. BIRD'S-EYE VIEW AND BLOCK PLAN, SHOWING A COMPACT GROUP OF BUILDINGS HAVING A CAPACITY OF 100 PATIENTS. COST, $137,000. (See illustrations 26, 46 and 51 for further description of this institution.)

Indiana State Tuberculosis Hospital, Rockville, Ind. (Illustration 7.) This institution is a good example of a well chosen site and also of a method of grouping buildings closely together. The accompanying picture is a bird's-eye perspective of the hospital and a portion of the grounds. The land cost the state $24,000 (approximately $50.00 per acre). There are five hundred and four acres of rolling, well-wooded land of which one hundred and twenty-five acres are along the creek bottom. The site lies on the east side of the Raccoon Valley about three miles east of Rockville, on a gravel road from Indianapolis. The hospital owns a free right-of-way for a railroad spur, of about one mile, to connect the property with the Central Indiana and the Vandalia Railroads, which run through the valley. There is a station and a siding within one mile of the site on both of the railroads. The buildings are located on high ground, slightly back from the edge of a bluff, with a beautiful view overlooking the valley. There is good, clean gravel and sand for building purposes on the bottom land, clear soft water in large quantities in a creek at the foot of the bluff, and good steam coal which can be delivered on the site at $1.60 per ton. The water for the institution is supplied by artesian wells in large quantities and is of the highest degree of purity. The plant has a capacity of one hundred patients and cost $137,000.

Portland Open Air Sanatorium, Portland, Ore. (Illustration 8.) The site of the Portland Open Air Sanatorium consists of eleven acres, six miles south of Portland on a bluff three hundred feet above the river. It is situated in a grove of evergreens, well sheltered from the winds, and is arranged to house all its patients in separate cottages for one or two persons each. These are arranged around two courts in front of the administration building. This plan is particularly interesting to superintendents of institutions housing only private cases, in a country having a mild, dry climate where dressing and bathrooms do not need to be heated.



No. 8.—Portland Open Air Sanatorium, Portland, Ore. WHIDDEN & LEWIS, ARCHITECTS. BLOCK PLAN SHOWING METHOD OF GROUPING COTTAGES ABOUT OPEN COURTS AND THEIR RELATION TO THE ADMINISTRATION BUILDINGS AT A PRIVATE SANATORIUM. CAPACITY, 40 PATIENTS. ESTIMATED COST, $60,000. (See illustrations 16 and 107 for further description of this institution.)

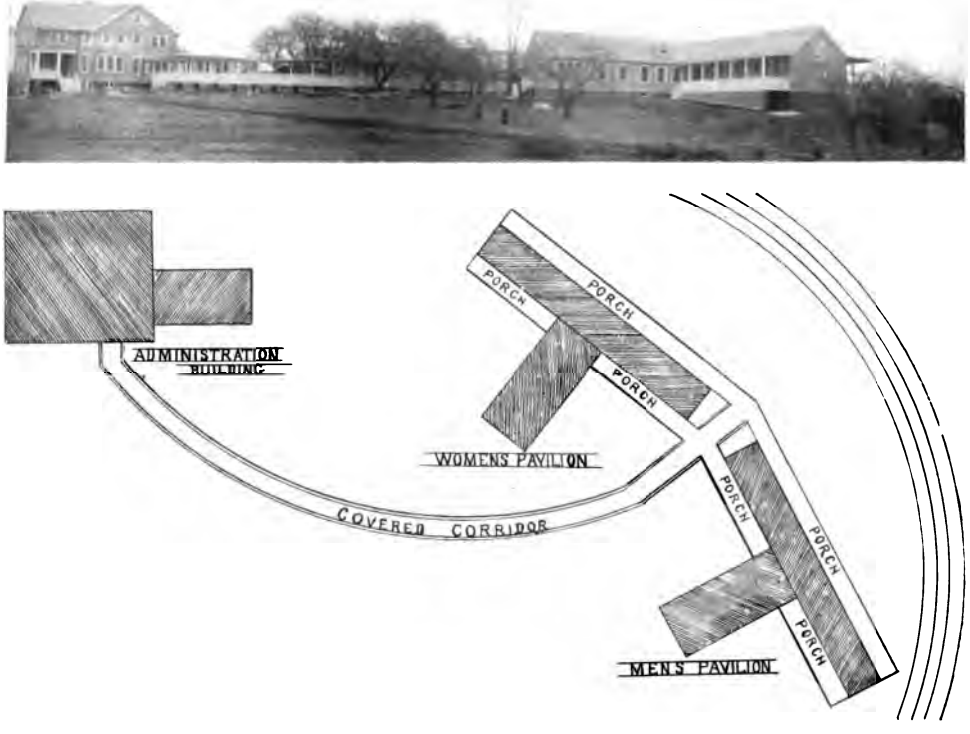


No. 9.—Vermont State Sanatorium, Pittsford, Vt. SCOPES & FEUSTMANN, ARCHITECTS. VIEW OF FRONT ELEVATION AND BLOCK PLAN, SHOWING METHOD OF GROUPING PAVILIONS IN FRONT, AND AT THE SIDES OF THE ADMINISTRATION BUILDING. CAPACITY, 40 PATIENTS. COST, $75,000.

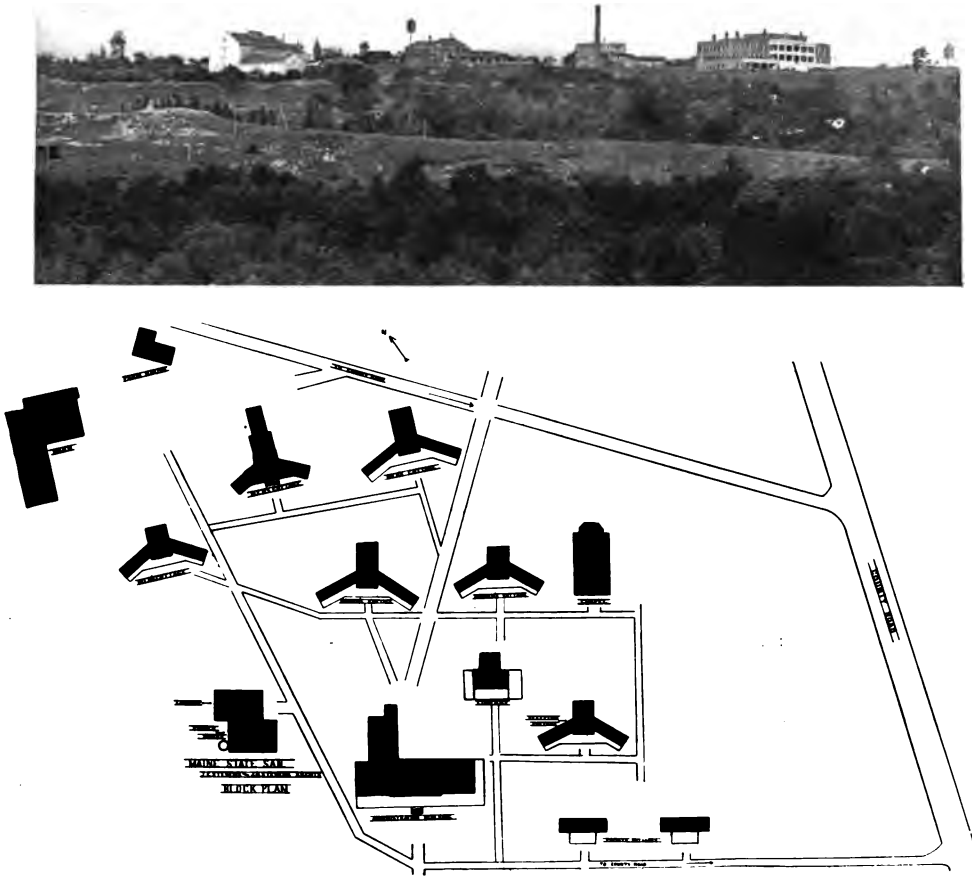
Vermont State Sanatorium, Pittsford, Vt. (Illustration 9.) The building site is located on a practically flat piece of land with mountains on all sides and protected on the north by a heavy growth of evergreen timber. About three hundred feet to the south of the institution is a sharp drop in the land of over one hundred feet, making a ravine in which there is a beautiful brook. The soil is a mixture of sand and gravel in which the infiltration of moisture is very rapid, and the water supply is procured from the Pittsford waterworks. The patients are housed in individual rooms and the porches are constructed under the main roofs of the building rather than in the usual method. The administration building is planned with the infirmary in the second story and for an administrative capacity of from seventy-five to eighty patients. The medical offices are placed in the

west wing and as far from the service wing as possible, in order to avoid the noise from the kitchen. The cottages are designed with a capacity for twelve patients each, six patients on a floor, and are connected with the administration building by covered ways which are used by the staff in inclement weather and as extra sitting-out space for the patients. The present capacity of the plant is forty patients and it cost approximately $75,000.

Essex County Tuberculosis Hospital, Soho, N. J. (Illustration 10.) This group of buildings is unusual, as the administration building is placed in the rear of the patients quarters, and all are on the top of a small knoll with the land sloping rather abruptly away in every direction. The three buildings are connected by a covered passageway and the pavilions have porches on the north as well as on the south side of the wards. This group of buildings was constructed as a part of the County Isolation Hospital, and is heated and lighted from the central power-house, which is on the same site. The pavilions are placed on brick piers and the administration building on a brick foundation, all constructed of



No. 10.—Essex County Tuberculosis Hospital for Advanced Cases, Soho, N. J. HURD & SUTTON, ARCHITECTS. VIEW OF BUILDINGS FROM THE REAR AND ONE SIDE, AND BLOCK PLAN SHOWING METHOD OF GROUPING BUILDINGS ON A KNOLL AND CONNECTING THEM BY A COVERED PASSAGEWAY. CAPACITY, 84 PATIENTS. ESTIMATED COST, $75,000.

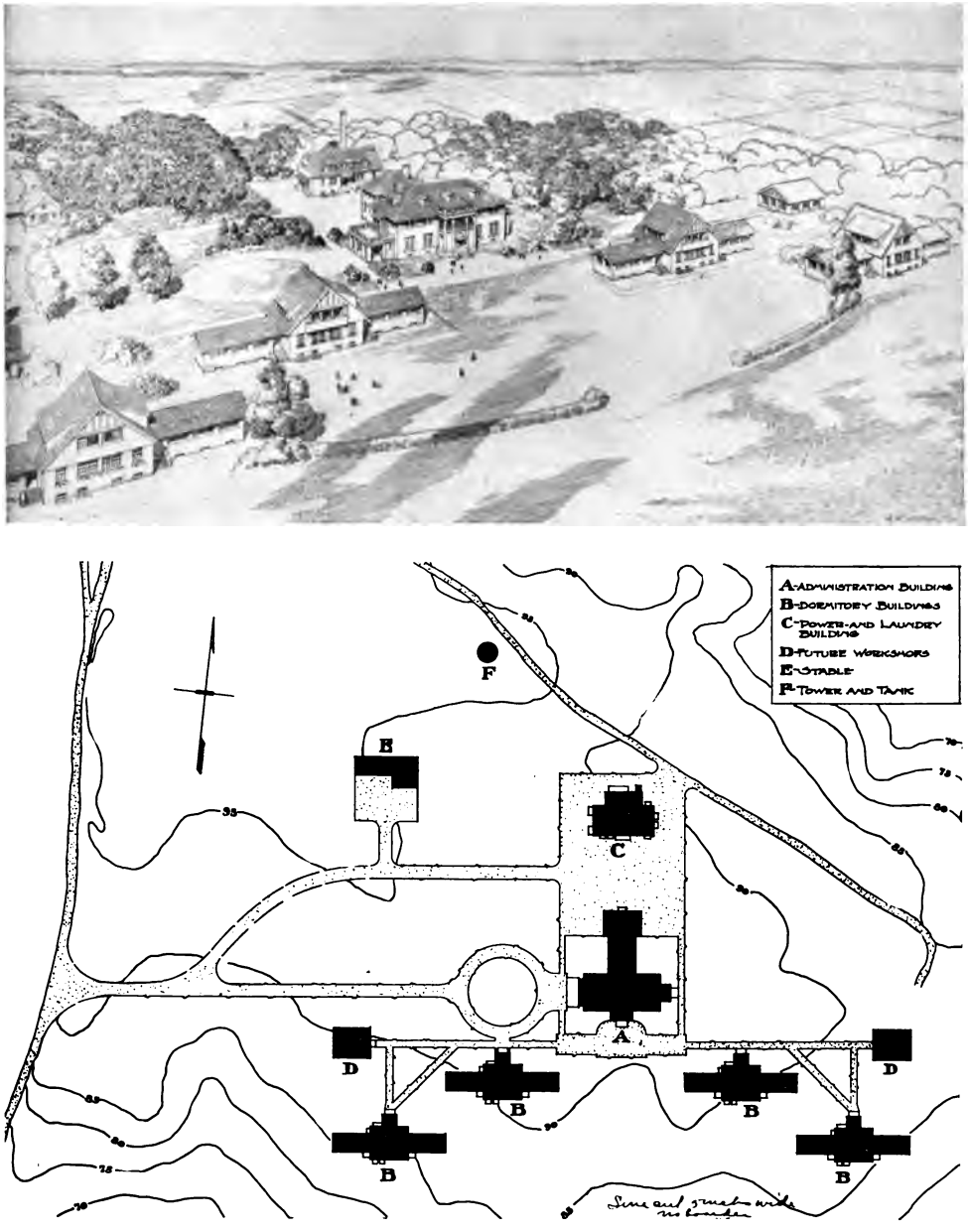


No. 11.—Maine State Sanatorium, Hebron, Me. T. C. Stevens and J. H. Stevens, Architects. View and Block Plan Showing Method of Grouping Pavilions in the Rear of the Administration Building and Power House. Capacity, 100 Patients. Estimated Cost, $150,000. (See illustrations 23 and 58 for further description of this institution.)

frame and covered externally with shingles. The capacity is for eighty-four advanced cases at an estimated cost of $75,000.

Maine State Sanatorium, Hebron, Me. (Illustration 11.) This institution is situated in the foot-hills of the White Mountains two miles from the Portland and Rumford Falls Railroad, in a very beautiful country, well known for the dryness of the atmosphere. The site is near the centre of the population of the state and consists of three hundred and twenty acres, of which one hundred and twenty-five acres are farm land and one hundred and thirty-five acres forest land. The buildings are well sheltered by a wooded mountain with a fine open view to the south. There are many natural features, such as forest land and logging camps with opportunities for winter sports, which interest the patients and are an important consideration in holding them. The water supply comes from springs and is stored in a reservoir, with a capacity of forty thousand gallons, by a pumping station

equipped with electric pumps. The soil is a loam with a subsoil of gravel, having an excellent drainage, and great fertility. Beside the administration building and pavilions, there is a power house, a cow-barn lighted by electricity and supplied with running water, having a capacity for twenty-five cows, a milk-house thoroughly equipped, heated by



No. 12.—Preventorium for Children, Farmingdale, N. J. Scopes & Feustmann, and Walter W. Judell, Associated Architects. Bird's-eye View and Block Plan Showing Method of Grouping the Buildings. (See illustrations 19, 27 and 95 for further description of this institution.)

steam and supplied with light and power, for the proper handling of milk and cream, a large silo with a capacity of fifteen acres of corn, a stable for ten horses and storage for one hundred and fifty tons of hay. The capacity of the plant is one hundred patients and it cost $150,000.

The Preventorium for Children, Farmingdale, N. J. (Illustration 12.) The site consists at present of about one hundred and fifty acres of land and is situated in a rolling country. The buildings are placed on a knoll seventy feet above the surrounding land, which has a gentle slope to the south, and a growth of timber on the north, giving good protection from the winter winds. It is within six or seven miles of Lakewood, N. J., well known for its dry climate and sandy soil. The entrance is about four hundred feet to the west of the country road and all the buildings are grouped about sixty feet apart. The dormitories containing the infirmaries are placed nearest to the administration building, described on page 145. There is a good sized creek within one thousand feet of the buildings and a small river one-half mile from the site. The Central Railroad of New Jersey crosses a corner of the property and the railroad company has put in a siding one-fourth mile from the power house without cost to the institution.

The water is supplied from an artesian well four hundred and fifty feet deep, which was driven at a point about seven hundred feet from the buildings, on lower land, and is covered by a small pump house in which is installed an electric pump driven by power generated in the central power house described on page 47. The water rises to within twelve feet of the surface and is conveyed to a wooden tank on a tower seventy-five feet high.

This institution was founded for the purpose of preventing children from becoming infected with tuberculosis who live in overcrowded parts of New York City and have parents who are tuberculous. They are sent from various clinics to the Preventorium where the sickly children, through wise supervision, open-air life and pure, good food, are usually completely restored to health in three or four months. Only those children between the ages of six and fourteen who are surrounded by tuberculous individuals and are without active tuberculous disease can be admitted to the institution. The buildings shown have a capacity for one hundred and twenty-eight children, and cost, including water supply and sewage disposal, $110,000.

SECTION II
Administration Buildings

SECTION II

Administration Buildings

Methods of Sanatorium Administration

A sanatorium consists of two distinct parts, one for housing the patients and the other for administrative purposes. Therefore, some kind of a building, or a portion of one at least, is necessary for the use of those who have charge of the institution. There are three general plans of administering sanatoria for tuberculous patients.

The first method is to provide for this use a certain number of apartments in the same building that houses the patients.

The second method (usually adopted at the present time) is to provide a separate administration building and group lean-tos or cottages about it for accommodating the patients.

The third method (used only by large institutions of more than one hundred and fifty patients and occupying a wide acreage) is to provide a general administration building near the centre of the site and divide the patients' quarters into two or more units, each grouped about a small service building containing a kitchen, dining-room and other apartments needed, and placed at various convenient positions on the site.

Planning Administration Buildings

In planning a sanatorium a good method to follow is to decide upon the number and character of buildings needed for administration and maintenance, then have these structures designed and constructed of substantial material on lines that can be enlarged when necessary. In arranging floor plans for the administration building and its auxiliary structures it should be noted that the housing of the administrative department practically includes all buildings on the site, with the exception of the patients' quarters. To house this department conveniently and in such a manner as will later tend to economical operation, the following questions should be decided if possible before the working drawings are begun.

1. The number of patients to be housed in the institution.
2. The stage of the disease to be treated.
3. The class in society from which the majority of patients will come.
4. The number of the staff and the method in which they shall be housed.
5. The number of servants and the method in which they shall be housed.
6. Shall the administrative offices and service department be housed under one roof or in two separate structures?
7. Shall an amusement pavilion be constructed, or a large room for recreation purposes be provided, in the administration building?
8. Shall an industrial shop be built for amusement and educational purposes?

9. What method of water supply and storage shall be used?
10. What method of heating shall be used?
11. What method of lighting shall be used?
12. Will power be needed?
13. Shall a power house be constructed?
14. Shall a laundry and sterilizing room be housed in a separate building, the power house, or in the administration building?
15. Shall a vacuum cleaning plant be installed?
16. Can natural ice be used and an ice house be constructed or will a cold storage plant be needed?
17. Shall the post-office, telephone exchange and store be housed in a separate structure or a room provided for these in the administration building?
18. Shall a carpenter and paint shop be constructed or housed in the basement of the administration building?
19. Shall a central store-house with platform scale and a bakery be constructed, or the basements of the various buildings used for storage and other purposes?
20. Shall the institution provide its own vegetables and construct a greenhouse, forcing beds and a root cellar?
21. Shall the institution conduct a farm and supply its own milk, eggs and dairy products?
22. Will a sewage disposal plant be needed?

Number and Class of Patients

The answers to the first three questions in this list will largely govern the solving of all the other problems. Therefore, the descriptions and estimates given here were obtained from public institutions having a capacity of about one hundred patients in various stages of the disease and coming from all classes of society.

Staff and Servants' Housing

The following list is given in order to assist in planning a sanitary method of housing the staff and servants at projected institutions. The salaries paid at the sanatorium from which this list was obtained are low because many convalescent patients apply for positions and are ready to accept smaller salaries than are usually paid for the same service in other institutions, in order that they may remain in surroundings which will tend to improve their physical condition.

Staff and Servants and their Salaries

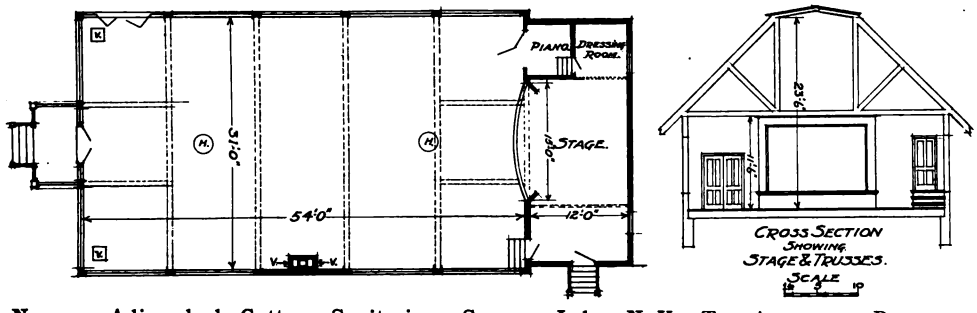
Superintendent (Physician)	$2,500.00	per annum.
Assistant Superintendent (Physician)	1,200.00	" "
Laboratory Director (Physician)	600.00	" "
Business Manager	1,200.00	" "
Bookkeeper and Clerk	300.00	" "
Stenographer	360.00	" "
Matron	480.00	" "
Superintendent of Nurses' Training School	900.00	" "
Dietician	900.00	" "
Ten Nurses (each $180.00)	1,800.00	" "
Three Orderlies (each $300.00)	900.00	" "
Postmaster and Storekeeper	120.00	" "
Chief Cook	960.00	" "
Two Cook's Assistants (each $240.00)	480.00	" "
Carried forward	$12,700.00	" "

Brought forward	$12,700.00	per	annum.
Chief Baker	720.00	"	"
Baker's Assistant	240.00	"	"
Dish Washer	300.00	"	"
Dish Washer's Assistant	216.00	"	"
Four Waitresses (each $216.00)	864.00	"	"
Six Maids (each $216.00)	1,296.00	"	"
Chief Engineer	900.00	"	"
Engineer's Assistant	480.00	"	"
Fireman	360.00	"	"
Carpenter and Painter	600.00	"	"
Gardener, in charge of Greenhouse and Grounds	720.00	"	"
Two Garden Helpers (each $360.00)	720.00	"	"
Poultry Man	600.00	"	"
Three Farm Hands (each $360.00)	1,080.00	"	"
Total	$21,796.00	"	"

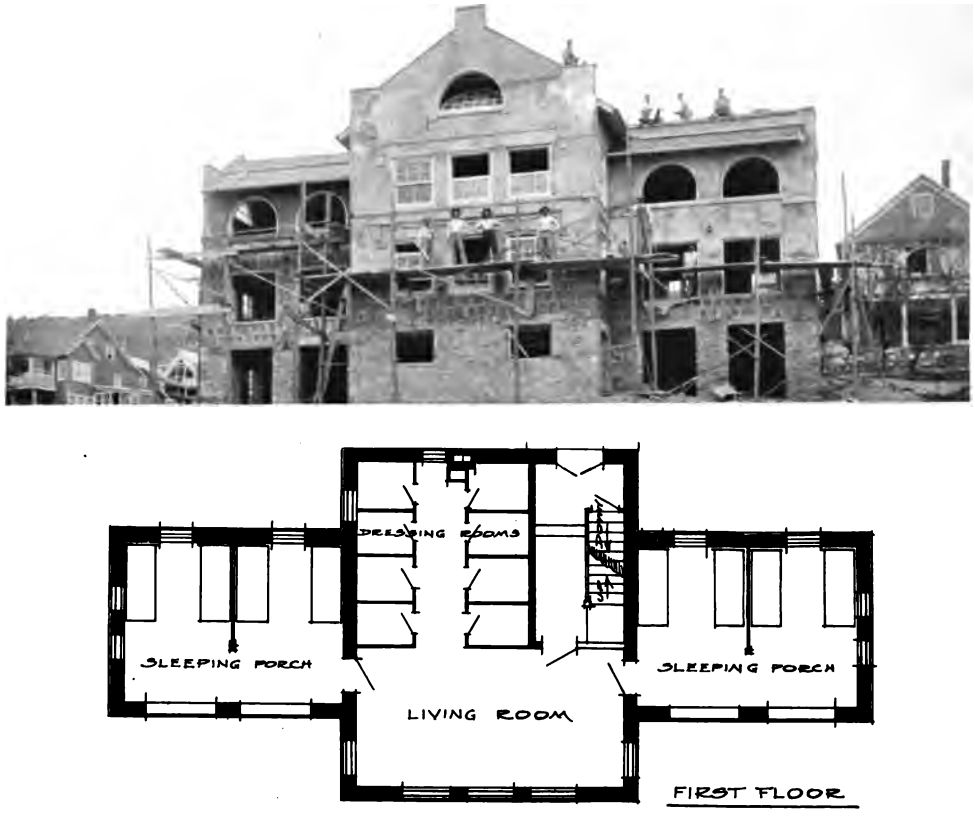
NOTE: This makes a pay-roll of $1816.00 per month.

As has been said a large proportion of the staff and servants may be incipient, convalescent or cured tuberculous patients and while the employment of this class will materially reduce the size of the pay-roll it will also call for careful hygienic and sanitary housing with provisions for outdoor sleeping.

The upper stories of the administration building when provided with porches, are used in many institutions for this purpose, although the construction of a staff cottage, a nurses' home, and a servants' pavilion is a better method of housing them.



No. 13.—Adirondack Cottage Sanitarium, Saranac Lake, N. Y. THE AMUSEMENT PAVILION. VIEWS OF THE EXTERIOR AND INTERIOR WITH FLOOR PLAN AND CROSS SECTION. (See illustrations 63, 98, 104 and 109 for further description of this institution.)



No. 14.—Municipal Sanatorium, Otisville, N. Y. Designed by Dr. Hermann M. Biggs. James D. Burt, Architect. Servants' Building No. 107. This Structure is an Example of a Lean-to Constructed with Fire-proof Material, Designed to Supply Open-air Sleeping Quarters for Servants who wish to Remain and Support Themselves at the Institution after Completing the Treatment. Capacity, 16 Persons; Cost, $5,000.

Municipal Sanatorium, Otisville, N. Y. The Servants' Building. (Illustration 14.) This is a two-story building, with a foundation of native stone. The walls are of eight-inch hollow terra cotta tile, burned hard, and plastered on both sides. The copings on the parapet walls are of cast concrete, moulded on both edges, and reinforced with waste wire. The outside is finished with wood float in sand, and coated with a water-proof paint. The inside is finished with plaster and painted with ordinary white lead and linseed oil.

Each person has an individual dressing room, about five feet square, made with low partitions in order to allow a free circulation of air, and furnished with a chair, table, mirror, shelf, and hooks for clothing. The sleeping porches are divided by low, transverse partitions running from the rear wall part way across the floor. This practically makes of the porches small rooms, sufficiently deep to allow space for an easy chair inside the open front. Both stories are alike and the porch floors have a pitch of three inches in order to drain storm and wash water to an outlet. There is a slop sink on each floor, an iron fire escape on the walls of both wings, and an attic covering the centre of the building. The basement contains a heating apparatus, two toilets, and baths.

The building accommodates sixteen persons, and cost exclusive of plumbing and heating, about $5,000.

Service Buildings

There is a growing feeling among the superintendents of many sanatoria that the best method of housing the dining room and kitchen, is to construct a separate service building. The principal advantage of this method of construction is in isolating from other departments the preparation of food, and in giving greater opportunity to build an open air dining room. It is also a much more economical way of building if an institution is to be started in a small way on lines which can be enlarged as it grows, for it is an easy matter to enlarge an administration building by constructing a service building nearby. For these reasons a number of large and small service buildings are described and illustrated in this section.

Amusement Pavilion

If good results are to be expected from the open air treatment of tuberculosis, the question of making the patients contented must be considered. Worry and depression are large factors in disease and anything that helps to do away with them is a part of the cure. Certain classes of patients often sit about a hospital or sanatorium day after day, brooding over their troubles and discussing among themselves their physical condition, which often retards recovery. If such patients are kept interested in other things they will have less time to think about themselves, and, therefore, amusements and interesting occupations should be provided. When possible, a separate amusement pavilion should be constructed. A recreation room placed in the administration building is not satisfactory, as it is very hard to ventilate, and patients taking the open air treatment are often oppressed by remaining indoors, and refuse to use such rooms. A separate structure for an institution of one hundred patients should be about seventy-five feet long by thirty feet wide, with a peaked roof. The building can be constructed of tile, brick, concrete or frame and the roof supported by trusses and covered with shingles or some patent roofing material. The main room should be open to the roof about twenty-three feet from the floor to the peak.

No. 15.—Example of a Dining Room in a Separate Structure Which can be Opened on All Sides.

No. 16.—Portland Open Air Sanatorium, Portland, Ore. VIEW OF THE INTERIOR OF THE AMUSEMENT PAVILION. (See illustrations 8 and 107 for further description of this institution.)

A stage can be placed at one end of this room, twelve feet deep by fifteen feet wide, with a small room on either side for dressing and other purposes. The building in northern climates must be heated, either from the central power house or by a small heating plant placed in a cellar under the main floor. Both sides and the end opposite the stage, except for the supporting columns, should be entirely constructed of adjustable windows or doors, so that the side of the building exposed to a wind or storm can be closed and the opposite side remain open. There should also be large ventilators in the peak of the roof and on the sides and ends of the building. (See Illustrations Nos. 13 and 16.)

Industrial Building

The same arguments which are used in advising a separate structure for an amusement pavilion, hold good in regard to an industrial shop. This building can be constructed along the same general lines and of the same material as the amusement pavilion, the dimensions being about fifty feet long by thirty feet wide, one and one-half stories high, and with both sides enclosed by glass doors or windows that can be entirely open when the weather permits. It should also be heated by connection with the general heating system or by a separate plant of its own and equipped with tools used in various industries, such as light carpentering, cabinet making, taxidermy, art work and photography. If the building is divided into a number of rooms, porches should be added so that the patients can work out of doors in good weather. In every institution there are always patients who will be greatly benefited by attending school and are glad of an opportunity to do so. As there is often a school teacher among the patients, who is willing to teach, space for a school-room, if needed, should be provided for in this building.

Part of the outfit can be a machine for stamping out sputum cups, for if suitable paper is supplied for this purpose, all the cups used at the sanatorium can be made by the patients.

The cost of such a building and equipment is about $4,000, but it may be advisable to start in a more modest way in order to test the interest of the patients in various occupations.

No. 17.—Catawba Sanatorium, Catawba, Va. AN EXAMPLE OF A GOOD METHOD OF STORING WATER WHERE STREAMS CAN BE PROTECTED FROM CONTAMINATION. (See illustrations 30, 69, and 80 for further description of this institution.)

Water Supply

Where there can be no connection with city or other public water mains, the water supply for an institution may be obtained in a number of ways and all available sources should be carefully studied. There may be sources which can be examined without great expense, such as old wells, springs, brooks, rivers, ponds and lakes, or sources which can only be accurately determined by experiments which are often quite costly, such as the driving of various kinds of wells and the building of dams for the collection of surface or other intermittent supplies of water.

Wells are often the only means by which water can be obtained, but shallow or dug wells should not be used, as the danger of contamination is very great. Driven or bored wells carried deep enough, usually three hundred or more feet, to avoid surface water, should always be sunk for institutional use and the site carefully selected with the view of preventing contamination of the water when it reaches the surface. Often where from thirty to fifty thousand gallons per day are needed more than one well must be driven in order to produce a sufficient supply. The cost of driving varies from $3.00 to $8.00 per foot, according to the size of the bore and the depth to which the well is carried.

In making investigations of a water supply, great care should be used to obtain information in regard to the chances of contamination of the source of the water, the chemical elements held in solution, and the amount of the flow at all seasons of the year. In order to decide whether a given source will supply the demand, an estimate of the daily consumption of the proposed institution should be computed. Although it is a very inaccurate method, this is usually done on the theory that there will be consumed in every twenty-four hours by each individual housed on the site, about one hundred gallons, by each horse or cow fifty gallons and for every acre of lawn, streets, paths, or garden five hundred gallons, and the estimate is intended to cover all water used for drinking, cooking, toilet, sprinkling and other necessities.

A careful inquiry has shown that institutions of one hundred patients having large sites with staff, servants and animals, and carrying on a farm, will use from twenty to fifty thousand gallons of water per day and should when possible have in reserve for emergencies, an amount at least equal to the daily consumption. The amount which should be stored, depends upon the nature of the site, which largely governs the expense of constructing reservoirs. For this reason from fifty to two hundred thousand gallons is about the limit where the cost is great, but where natural basins can be used by erecting a small dam, larger quantities can be held for a small outlay. The storage of water in a reinforced concrete reservoir is the most satisfactory if there is a natural elevation near the buildings.

Reservoirs can usually be placed in the most convenient position available without fear of obtaining too great a pressure in the mains, as the force produced by water brought from a height is greatly reduced by the friction in the pipes. Where there are no

natural elevations, water can be distributed through an institution and a moderate amount stored by tanks on towers, or in the top of the buildings. Also by stand pipes, largely used by small towns in the middle west, which give good service and can be adopted for the larger institutions, and the various systems of water supply using a pressure tank for small sanatoria.

Light, Heat and Power

The problem of lighting, heating, and the installation of power for an institution depends largely upon its situation. Generally the furnishing of light for hospitals for advanced cases situated in cities and their suburbs is not a difficult matter, as the trunk line of the city electric lighting system or the mains for illuminating gas are usually not far distant.

The lighting of sanatoria in isolated country districts is more complicated and a choice lies between the use of kerosene oil lamps, one of the various processes for generating illuminating gas by individual gas machines from oil, gasolene or acetylene, or electricity produced by a privately owned plant. At the present time electricity is generally used, and when installed in an institution having a capacity of one hundred patients housed in various structures, it is estimated that about five hundred and fifty, sixteen candle power and one hundred and fifty, two or four candle power lamps for the buildings, six one hundred candle power arc lights for the grounds, two six thousand candle power generators and two fifty horse power engines will be needed, the lamps being apportioned as follows:

Administration Building	154 lights
Two Advanced Case Pavilions	150 "
Three Incipient Case Pavilions	183 "
Nurses' Quarters	66 "
Amusement Pavilion	50 "
Laundry	15 "
Power House	15 "
Tunnel	20 "
Grounds	6 arc lights

Four candle power lights can be used to good advantage in many places, such as hall-ways, closets, toilets and porches, and are a great saving, as every candle power needlessly used in the course of a year means a waste of fuel.

In heating sanatorium buildings practically every method has been tried and can still be found giving fairly good service at one or another of the various institutions. These in a general way are steam and hot water plants, hot air furnaces, stoves, fire-places and gas fixtures. Here again the location and climate are largely the determining factors in making a choice of a method of heating, particularly where the buildings of an institution are heated as separate units.

Power can be used for lighting, pumping, vacuum cleaning, driving laundry machinery, a cold storage plant, elevators, *x*-ray apparatus, laboratory instruments, lathes, circular saws and other machinery in carpenter and repair shops.

Power House

In discussing the needs for light, heat and power, and the methods to be employed in producing them, it should be remembered that it is possible where a central plant is to

No. 18.—Waverly Hill Sanatorium, Waverly Hill, Ky. J. J. GAFFNEY, ARCHITECT. VIEW FROM THE REAR SHOWING A METHOD OF USING THE TOP AND SIDE OF A HILL IN ORDER TO OBTAIN A POSITION BELOW THE BUILDINGS FOR THE POWER PLANT. (See illustration 5 for further description of this institution.)

be assembled to house it either in the basement of one of the buildings or in a power house especially constructed for it; but there seems to be a strong feeling against installing it in the basement of any sanatorium or hospital building, as the heat from the boilers is very disagreeable and the noise and dust penetrate to other parts of the structure. If the institution grows the time is sure to come when it will have to be removed, and therefore it is advisable to house even a very small plant in an isolated power house when starting an institution. This should be placed below the site of all buildings to be heated, in order to allow the return by gravity, of condensed steam or hot water from the heating apparatus, and if this is impossible where the land is flat, a pit must be dug under the plant for this purpose. In choosing a site the question of placing the building beside a siding or spur from a railroad should be considered, for such a position will greatly reduce the expense of handling coal and ashes. The administration and all other buildings to be heated, should be grouped near enough to the power house to allow connecting them by a concrete or brick tunnel three feet wide by six feet high, as much trouble and expense will be saved if the pipes and wires connecting the buildings can be inspected through their full length at all times.

The building should be of brick or reinforced concrete construction, one story high and divided into an engine room, boiler room, oil room and dressing room, containing toilets and shower baths. The coal bins should also be of concrete having a capacity of six or eight carloads, placed on the outside of the building, and arranged, if possible, so that the coal can be dumped directly into them from the cars.

In equipping various power houses the question of installing low for high pressure boilers and substituting gasolene or oil for steam engines, in producing heat and power, has been carefully investigated. It now seems to be the consensus of opinion among engineers and architects having large experience with isolated power plants, that the use of high pressure boilers with steam engines is the cheapest method, at the present time, of produc-

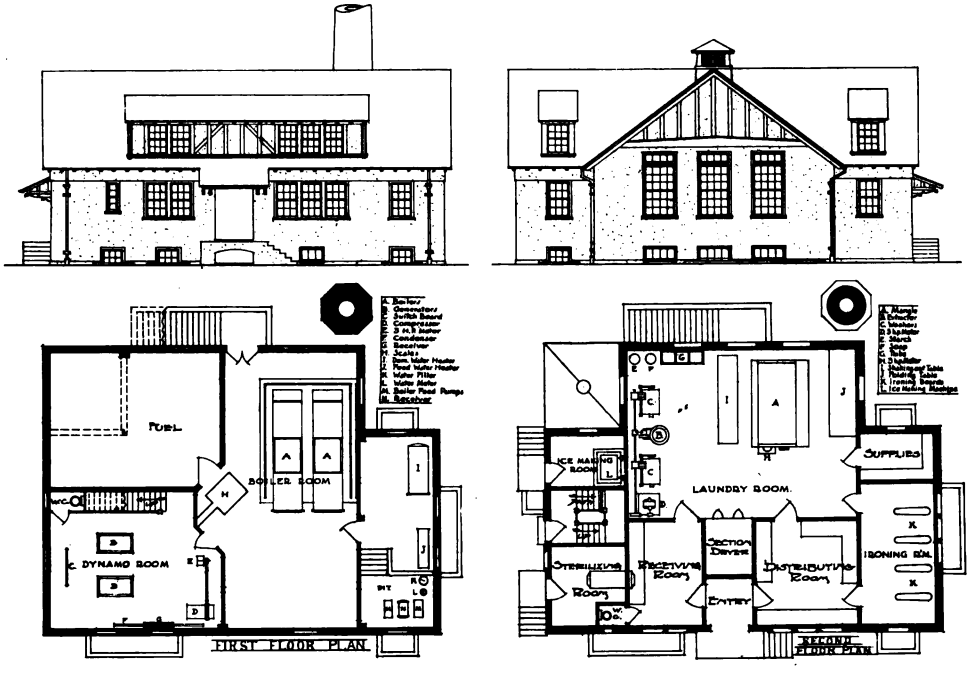
ing light, heat and power for public institutions when the exhaust steam is used for heating. If this method is adopted the equipment for the power house should consist of:

Two Steam Boilers of 100 H. P. each
One Water Tank for Service Hot Water
Two Steam Engines
Two Electric Generators
One Storage Battery
One Oil Separator
One Coal Truck and Track
One Open Feed Water Heater
Two Water Pumps
One Fire Pump
Two Mechanical Stokers
One Set of Machinist's Tools
One Power Drill and Lathe

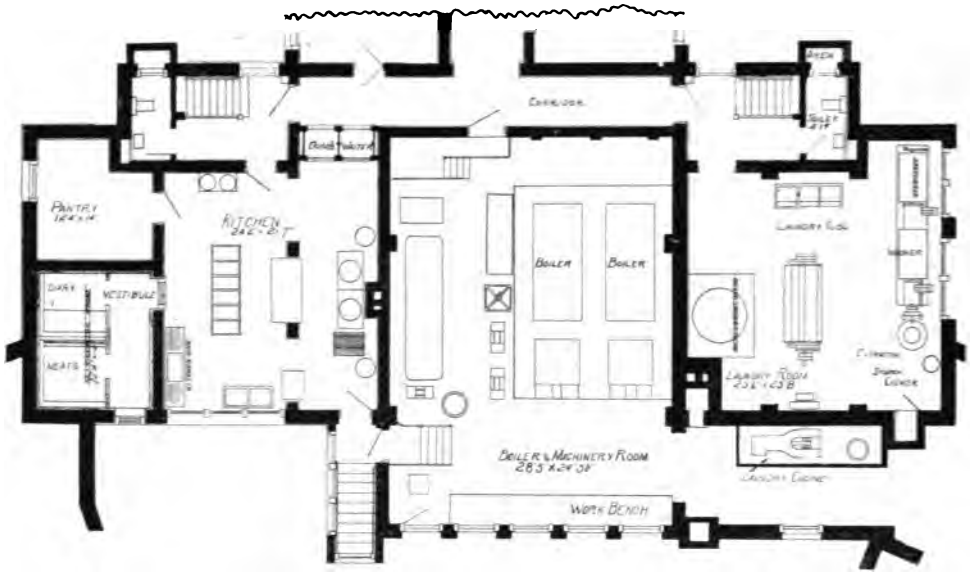
The building with equipment will cost about $15,000.

EXAMPLE OF POWER HOUSE

The Preventorium for Children, Farmingdale, N. J., POWER HOUSE (Illustration 19). This is a two story building, 59 feet wide by 43 feet deep. The first story walls are of hollow tile with reinforced concrete construction, and fireproof partitions of hollow tile. There are two complete power units, each consisting of a high pressure horizontal tubular boiler, a steam turbine directly connected with an electric generator and a switchboard. There is also an ice-making machine, a large scale for weighing fuel and a hot water storage tank. The second floor houses the laundry and has partitions of frame, covered with wooden lath and plaster. It is divided into a receiving and sterilizing room



No. 19.—Preventorium for Children, Farmingdale, N. J. SCOPES & FEUSTMANN, AND WALTER W. JUDELL, ASSOCIATED ARCHITECTS. POWER HOUSE AND LAUNDRY. FRONT AND SIDE ELEVATIONS WITH FIRST AND SECOND FLOOR PLANS. (See illustrations 12, 27 and 95 for further description of this institution.)



No. 20.—District Tuberculosis Hospital, Lima, Ohio. McLaughlin & Hulskin, Architects. A Part of the Basement Floor Plan, Showing Arrangement of Laundry and Power Plant, in an Administration Building. (See illustration 43 for further description of this institution.)

equipped with a pressure steam sterilizer, a general laundry room containing metal washers, an extractor, mangles and steam pressure pumps and electric motors for running the machinery, an ironing room equipped with electric irons, a distributing room, and a room over the ice-machine from which ice is distributed to the small refrigerators in the various buildings.

The third or attic floor is divided into four large rooms and bath for the male help, and is reached by a separate stairway which does not open on to the laundry floor.

The building cost $9,000 and the mechanical equipment of the institution, including water supply and sewage disposal, cost $32,000.

The Laundry

The laundry should be housed in a separate building, thirty feet wide by fifty feet long, and one and one-half stories high, open to the peak and constructed of reinforced concrete or brick, or it can be placed in the power house and made a part of that building. It should be divided into four rooms for receiving the soiled clothes, washing, ironing and sorting. Laundries placed in the basements of administration buildings have been unsatisfactory, as proper ventilation is impossible. The building should have a cement floor and if finished on the interior, plastered with hard plaster and painted. The hot water and steam as well as the power for driving the machinery can be supplied from the power house and the equipment should consist of

Two Washers	One Tank for Mixing Soap with Steam
One Centrifugal Wringer	Two Sets of Irons
Two Mangles	One Set of Sorters' Shelves
Two Drying Racks	Six Tables

In some districts a cistern for storing rain water will be needed. The entire plant including the cistern can be constructed and equipped for from $6,000 to $10,000.

Sterilizing Room

Connected with the laundry there should be a sterilizing room about ten feet wide by twenty feet long, constructed of concrete with a cement floor and equipped with a rectangular steam disinfecting chamber, thirty inches wide, fifty inches high and eighty-four inches long. This chamber is usually built with an inner and outer shell of steel plates securely riveted to the end frames and closed by doors at both ends hung from davit cranes. They are also equipped with a wrought iron car, an inside and outside car truck, two cast iron supports, a thermometer, steam pressure gauge, vacuum and pressure gauge and two safety valves. With an instrument of this size, beds, bedding, linen and clothes needing disinfecting can be sterilized. The room and sterilizer in connection with the laundry, if placed near the power house, can be constructed and installed for about $1,500. (See Illustration 21.)

Vacuum Cleaning Plant

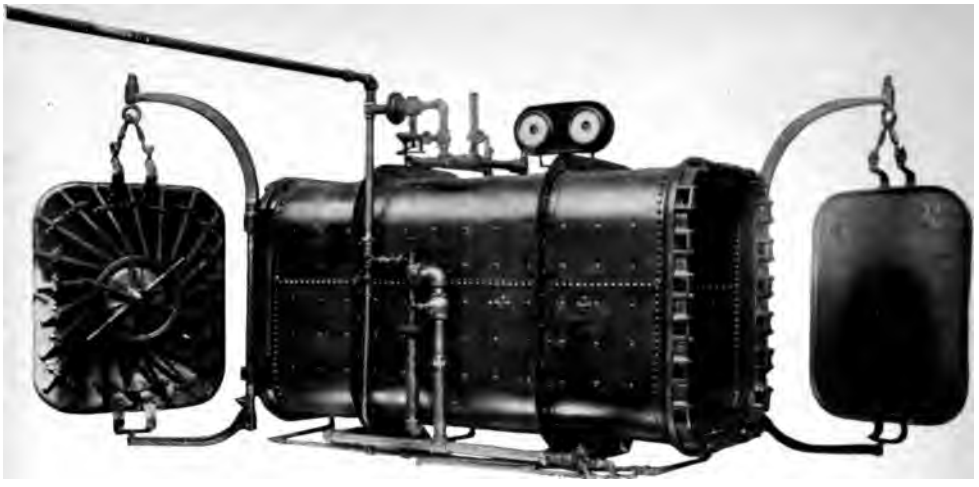
This method of cleaning sanatoria and hospitals is becoming popular. It is said that from an economical point of view it will pay to have it installed, and will save in labor fifty per cent of the cost of cleaning, that it also reduces to a minimum the wear on paint, plaster, wood-work, decorations and other finish of the buildings. By this method cleaning can be done without stirring up the dust and dirt, and waste of all kinds which cannot be reached by the ordinary means, is easily removed from corners, nooks and cracks. The usual plant installed for institutions is operated by electricity obtained from the generator, which supplies the current for lighting. The power necessary is about one hundred and ten volts, but when it is not available the plant can be operated by a two cylinder ten horse power gasolene engine.

The vacuum cleaning machine itself is placed in the power house or basement of the administration building, and consists of a reciprocating pump, with a motor on the same frame, and a separator. It is connected with all the buildings by a main trunk line pipe, giving off vertical pipes ending in service inlets at convenient points where a hose can be attached for the cleaners. These inlets are usually placed in the walls of the corridors near the floor but can be installed at any point desired. The hose which connects them with the cleaner can be fifty feet long, if desired, and the intakes located at points where a circle of fifty feet from them will reach every place to be cleaned. The dust and dirt is conveyed from the apartment being cleaned, through the hose, vertical lines, and trunk lines, to the separator, where about ninety-eight per cent of the dirt is taken out of the air drawn into the pipes. The balance, or two per cent of the dust and dirt, passes through the machine and out of an exhaust pipe which discharges into a flue or other convenient place to reach the open air. A vacuum plant suitable for a sanatorium while cleaning an apartment removes about two hundred and forty cubic feet of air per minute. If this is replaced through open windows by pure, fresh air, the rooms will be well ventilated while the machine is in use.

The pump and separator will cost $1,500, the piping and installation of the plant about $1,000 more, making a total cost of the plant of $2,500. Three complete sets of sweepers and tools are supplied with the machine and extra sets consisting of a floor sweeper, floor brush, renovator and tufter cost $75.00.

Ice House or Cold Storage Plant

Ice is an absolute necessity in a hospital or sanatorium; therefore, some means of manufacturing or storing it must be supplied. The construction of an ice-house is a simple



No. 21.—A Rectangular Steam Disinfecting Chamber, for Use in Connection with the Laundry. A Convenient Shape for Tuberculosis Hospital and Sanatorium Work. Loaned by The Kny-Sheerer Company.

matter for a small institution, if natural ice can be obtained on or near the site, but the installing of a refrigerating plant is usually cheaper for large institutions than the building and filling of an ice house. If a cold storage plant is constructed it should be placed in the administration building or store house and arranged to provide coils for the various refrigerators. The cost will be from $1,800 to $3,000.

The Carpenter and Paint Shop

A repair shop may be combined with one of the barns, the industrial shop, or constructed as a separate building. It should be about ninety feet long by twenty feet wide, constructed of frame, brick, or concrete, one story high, with peaked roof and an air space above the ceiling. It can be divided into a carpenter's room, paint room, store-room and storage room for drying lumber; and equipped with a circular power saw, necessary carpenter and cabinet-makers' tools, and a painter's outfit. The man in charge should be a good practical cabinet-maker able to repair furniture and the woodwork of the buildings, and have a painter as one of his assistants. This department has a large share in the up-keep of the entire institution and will well repay the investment of $1,500 to $2,000 necessary to build and equip it.

The Store House, Bakery and Scale House

A large amount of storage space is a necessity in a sanatorium or hospital. Groceries, grains, vegetables and other winter food supplies, furnishings, linens, clothes, and many things for the farm or grounds must be bought in bulk or numbers, in order to obtain fair prices. At many institutions, portions of the basements and cellars of the various buildings are used as storage rooms, but this is a wasteful and inconvenient method of administration and should be abandoned. Buildings are more sanitary when rightly constructed without arrangements for storage purposes, but with low foundations and cellars having a good circulation of air, so there is no good reason for housing stores in this manner.

It has been tried and found very satisfactory, as well as a great help in reducing expenses, to have a separate store house under the care of an employee who gives his time to the details of ordering and distributing supplies.

At all large institutions the bakery should be separate from the kitchen. In a number of instances it has been placed in the basement of administration buildings, but this is not satisfactory, as it requires the baker and his assistants to work in a room that is hot and hard to ventilate. A small separate structure connected with the general store house or as a part of it, should be built for this purpose; the bake room to be about twelve by fifteen feet with the oven constructed outside the walls.

In connection with the store house and bakery there should be a platform scale. The weighing room may be a separate, small frame building, or a part of the store house, with the scale platform on the outside, arranged so that trucks and wagons can conveniently be run over it. The scale will cost about $80.00. There is no doubt that the saving made by a careful oversight and concentration of the stores and the weighing of the grain and other supplies bought in bulk, will soon pay for the construction of a store house. A bakery and store house equipped with a scale can be built for from $1,200 to $2,000.

Green House, Forcing Beds and Vegetable Cellar

A green house for vegetables, plants and flowers can be placed near the power house, and by using the surplus steam for heating it and the forcing beds, a supply of fresh lettuce, radishes, onions, rhubarb, spinach, parsley, turnips and other green vegetables may be produced during the entire winter. This building should have in connection with it, about 200 feet of cold frame or glass forcing beds, and a root or vegetable cellar constructed of concrete, half above and half below ground level, with bins and divisions, of the same material. A root cellar is a need which is generally put off, with the idea of using the basements of the building for this purpose, but because of the pipes and mains from the heating plant, basements often cannot be used.

The expense of building a green house, frames and root cellar will be about $5,000.

Garage, Barn, Stable and Farm Outfit

It is necessary to have a stable for farm, carriage and riding horses, in conjunction with a barn for housing saddles, harness, carriages, wagons, machinery and tools, and a garage for motors when institutions are located in more or less secluded sections of the country. This building can be constructed of frame, brick, concrete, tile, or reinforced concrete, and may, if desired, combine with it under one roof the industrial, carpenter and paint shops. A barn can be erected for from $5,000 to $10,000, depending upon the size and finish of the building. The following list obtained from a state sanatorium, is a partial outfit of farm tools and machinery, which will be needed if a farm is a part of the institution.

Two Farm Wagons
One Delivery Wagon
One Wagon Scale
Two Double Sets of Harness
One Single Set of Harness
One Sulky Plow
One Ordinary Plow
One Harrow
One Mowing Machine
One Side Delivery Rake
One Potato Planter
One Potato Digger
One Corn Planter
One Corn Binder
One Power Feed Mill
One Power Hay Cutter
One Hand Cart
Two Two-horse Cultivators
One One-horse Cultivator
One Fanning Mill

One Hay Loader
Six Hay Slings
One Hay Carrier and Rope
Two Hay Racks
One Horse Lawn Mowing Machine
One Horse Lawn Roller
One Meadow Seeder
One Manure Separator
One Feed Cooker for Garbage
One Potato Sprayer
Two Scythes
Two Corn Shredders
One Set of Garden Tools
Shovels
Spades
Other Small Farm Implements

The Cow Barn

One method of keeping down the cost of maintaining an institution is through owning cows and producing milk and butter. Some institutions have shown that the purchase of milk from outside sources costs double the amount necessary to produce it on the site. It is estimated that an institution for one hundred patients will consume the milk from thirty-five cows, as one-fourth of the herd is usually dry.

A cow-barn should be kept clean and the animals made comfortable. This is most easily done if the floor is of concrete, well drained and the building arranged to admit plenty of light and air. The cows should be held by movable stanchions, facing each other on either side of a feeding alley in the centre of the building.

Such a barn may be constructed of reinforced concrete, tile, bricks, or wood, the dimensions about thirty-six feet wide by eighty-six feet long, one story high, with side walls seven feet six inches high and nine feet clear at the centre. The roof can be supported by trusses and covered with shingles or composition roofing, the interior sealed with smooth painted tongued and grooved boards or plastered over metal lath. The concrete floor ought to be on a slight grade, drained at one end, and by gutters in the manure alleys fourteen inches wide by six inches deep. The ventilation should be carried out through a double system of air spaces in the walls, following the King method of heating and ventilation by means of the heat given off by the cows. The central feeding alley should be nine feet wide, the manure alleys four feet wide, and the cross alley dividing the stalls into sections seven feet wide. The stalls should be three feet wide, with a graded depth for different sized cows of from four feet eight inches to five feet, and constructed of iron piping, fitted with chain hung stanchions. The mangers can be made of concrete in the form of a long trough for each section, having a slight fall toward one end so that they can be washed, flooded with water and drained.

The Silo

A silo is a tank in which fodder in the green state is preserved. It is usually round and can be built of reinforced concrete, brick, concrete tile or wood and is considered one of the best and cheapest buildings for storing and handling fodder for feeding a herd of milch cows. A silo large enough to store fodder to feed a herd of thirty-five cows for six months should have a capacity of one hundred and twenty-six tons, a diameter of fifteen feet, a height of thirty-four feet, and will require about eight and one-half acres of land planted with corn to fill it. It should be placed beside the cow barn in a convenient position so that the fodder, which is heavy, can be handled easily.

The Milk House

A milk house should be arranged to concentrate the work of the milkers and care for the milk by the best methods. Hot water and steam will be needed and can be piped

from the power house or supplied by a small vertical boiler installed in the building. A wash room for the milkers should be placed so it can be entered without passing through the other parts of the milk house. Such a building constructed of frame or tile, twenty-one feet wide by twenty-two feet long, one story high, with peaked roof, plastered on the interior, with round corners, and cement floors, will be found convenient. It may be divided into four rooms ten feet high in the clear, and connected with the barn by an enclosed covered passageway seven feet wide. The weighing room is eight feet wide by eight feet deep and contains a desk for records, a scale for weighing each milking, and a platform under a movable funnel for conveying the milk to the cooler in the adjoining room. The bottling room is eight feet wide by twelve feet long, equipped with a cooler, bottler, and a refrigerator. The utensil wash room is twelve feet wide by thirteen feet long, fitted with hot and cold water faucets, two large sinks, a sun rack and a utensil sterilizer built into the wall so that the bottles placed in it from the wash room can be removed in the bottling room beside the spout of the cooler. The milkers' wash and locker room is eight feet wide by thirteen feet long, containing two hand wash basins, running hot and cold water, and four iron lockers for towels and milkers' clothes.

The capacity of the barn is thirty-five cows and the plant complete, including barn, milk house, silo, and a cow shed, can be constructed of concrete tile for from $5,000 to $10,000.

Chicken and Hog Houses

Chickens and hogs are also a part of the equipment of many sanatoria. It is said that fifteen hundred to two thousand hens will supply chickens and eggs through the entire year for an institution of one hundred patients if the surplus of eggs produced in the spring and summer are preserved in lime or by cold storage. An outfit including chickens, colony houses, incubators and other equipment costs about $3,000.

There is enough refuse from the tables of large institutions to feed twenty-five hogs and the annual income from this number at one sanatorium is about four hundred dollars a year. In order to make these animals profitable a healthy herd is necessary; therefore, care must be used to eliminate those with disease when purchasing them. To prevent the possibility of infection later a steam cooker should be installed and all table refuse used for feeding passed through it. A sanitary hog house with a wire screened run can be built for $1,000.

Sewage Disposal Plant

A hospital or sanatorium which is not situated close enough to some town for connection with its sewer system will need a sewage disposal plant, the method of sewage disposal to be installed depending largely upon the site obtained for the institution. Where a farm is part of the property the simplest methods can be used, such as a septic tank with a subsoil distributing field. A small disposal plant of this kind to serve a limited number of people may consist only of a septic tank about twenty feet by twenty feet and six feet deep, divided into two compartments and distributing the sewage at intervals to the subsoil of a level cultivated field by open jointed agricultural drain tiles, laid at a depth of about ten inches from the surface. The disposal field should be divided into sections, and the sewage discharged into one section after another, allowing enough time to intervene after the use of each one before it is used again for the absorption of the entire discharge. It is estimated that from one to three feet of drain tile according to the nature of the soil will dispose of one gallon of sewage.

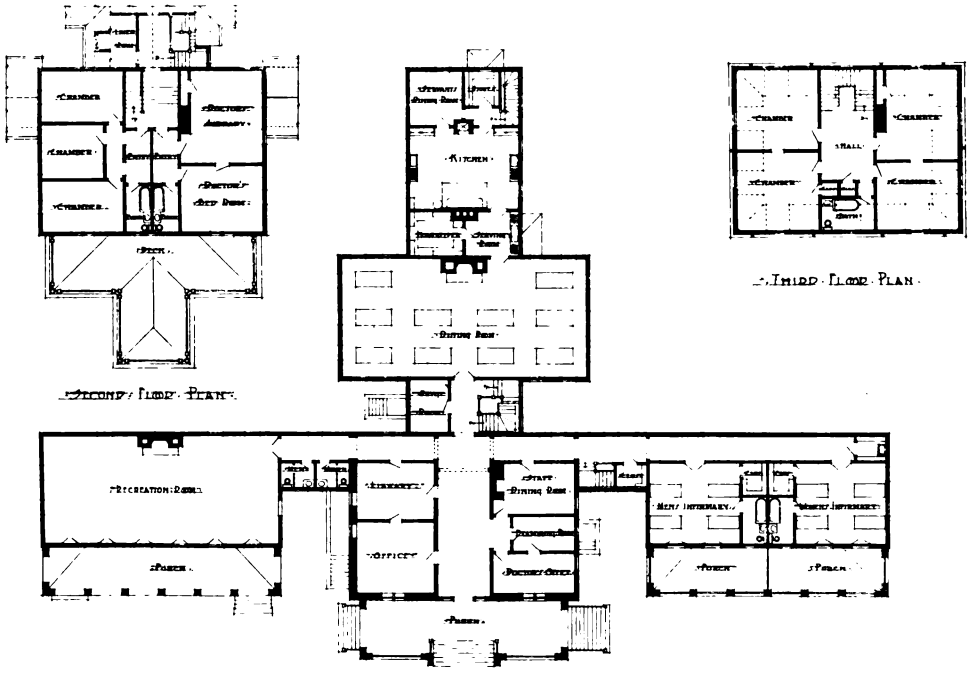
Where the site of a large sanatorium is small or a running stream or lake is near and below the buildings, filter beds must be used in connection with the septic tanks. The effluent of the septic tanks is then passed through siphons, which intermittently discharge a part of the contents of the tank evenly over the surface of a filter. Usually two or more filters are used, the sewage being deposited upon one after another automatically. Different conditions require a variation of methods in sewage purification and numerous varieties of filters have been devised. Sand, gravel, broken stone, clinker, coke and other material are used with success, the object being to expose the contents of the septic tank to the air and the action of bacteria, and in this manner purify the sewage as it passes through the filter and before it is allowed to flow away. It is estimated that a septic tank of the dimensions given above and two sand filters twenty-five by one hundred feet in area and four feet deep each, will purify the sewage from about three hundred people and will cost from $1,000 to $3,000.

EXAMPLES OF ADMINISTRATION BUILDINGS

Eudowood Sanatorium, Towson, Md., ADMINISTRATION BUILDING (Illustration 22). This building was rebuilt and greatly enlarged in 1908, only a part of the old building having been retained as a nucleus, and even this was entirely rearranged. The main or central portion was originally a country residence. It is forty-eight feet wide by thirty-five feet deep, of frame construction, externally covered with shingles, two stories with a high basement and a third or attic story under the roof supplied with light by dormer windows. The foundation is of native stone carried well up above the ground level in order to give light and air to the basement. There is a porch twelve feet wide across the entire front of the first and second stories and the interior on the first floor is divided in the centre from front to rear by a broad hall twelve feet wide. An office 15 feet wide by 15 feet deep, and a library 12 feet wide by 15 feet deep, are on one side of the hall, and on the other a physician's office 8 feet wide by 17 feet deep, an examination room 7 feet wide by 12 feet deep and a staff dining room 12 feet wide by 17 feet deep.

The second story is arranged into two separate apartments, one, of two large rooms and bath for the superintendent, and the other, of three small rooms and bath, for the matron. The third story is divided into four chambers and a bath for the nurses. The new additions consisted of two large wings and a rear extension. The side wings are both 24 feet wide by 52 feet long, connected to the sides of the main building by passageways fourteen feet long, making the entire front one hundred and eighty-three feet long. The rear extension is sixty-eight feet long, also joined to the main structure by a covered corridor. The wing to the right of the building consists of one large room 23 feet deep by 50 feet long, with a ten foot porch on the front given up to amusement purposes. The wing to the left is an infirmary, divided into two small wards 20 feet wide by 18 feet deep, for four beds each, with toilets and baths, and a porch in front ten feet wide.

The rear extension contains a spacious well lighted dining room 54 feet wide by 35 feet deep, having a seating capacity of sixty patients and containing a large open fireplace. Behind this room in the same extension is a kitchen 24 feet wide by 18 feet deep, a servants' dining room, pantry, sewing room and storage. The rear extension was built so as to allow the patients to enter the dining room at the rear of the administrative offices, thus avoiding the tracking of dirt and mud through the main building, and in order to cut off the noise usually made by a large number of people



No. 22.—Eudowood Sanatorium, Towson, Md. Archer & Allen, Architects. The Administration, Recreation, Infirmary and Service Buildings. View of Front Elevation and Floor Plans. Administrative Capacity, 100 Patients. Estimated Cost, $60,000. (See illustrations 61 and 83 for further description of this institution.)

dining together. The extensions are constructed of frame, covered with shingles that harmonize with the exterior of the main section, and the windows of the entire building are fitted on the outside with slat blinds in order to shut out the heat and light during the summer. During the remodeling there was also installed a central hot water vacuum plant to heat the entire structure.

These improvements have resulted in providing a group of buildings extending from one centre and admirably adapted to the requirements. They have also doubled the previous administrative facilities, there now being a capacity for one hundred patients, at a cost of about $50,000.

Maine State Sanatorium, Hebron, Me., ADMINISTRATION BUILDING (Illustration 23). This building is two full stories with a basement, and a third story over the centre. It is constructed of red brick with gray brick and concrete trimmings for the window caps, plates, etc. The roof is tar and gravel, drained in the centre because of the danger of snowslides. The main front is 147 feet long by 53 feet wide, with an extension to the rear at one end 66 feet deep by 33 feet wide. The front basement contains a small medical suite, divided into a laboratory, pharmacy, examination and waiting rooms, a sterilizing chamber, billiard and storage rooms. In the rear extension of the basement is a section for servants' quarters.

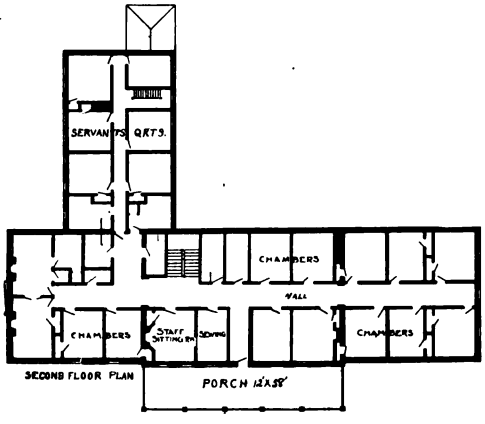
The first floor is flanked on the front by a porch 12 feet wide by 147 feet long and on the south side 10 feet wide by 36 feet long. It is divided into a large dining room and an assembly room, both 38 feet wide by 36 feet deep, and connected through the centre of the building by a corridor with rooms on both sides. On the front is a parlor 17 feet wide by 24 feet long, an office 15 feet wide by 17 feet long, and a waiting room 10 feet wide by 17 feet long. On the rear is a reading room 16 feet wide by 19 feet long and toilets, washrooms and other conveniences. The rear extension on the first floor contains a kitchen 30 feet wide by 18 feet deep, and serving room 16 feet wide by 17 feet deep, pantry, cold storage and servants' dining room 19 feet wide by 16 feet deep. The second floor is divided by a long corridor seven feet wide running down the centre of the building, with good-sized rooms on each side for the superintendent, staff, patients and visitors, well supplied with closets, baths, toilets and other conveniences. This story is also flanked on the front by a porch 12 feet wide by 57 feet long, and one on the south side 10 feet wide by 36 feet long.

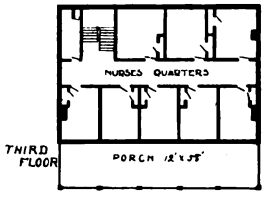
The third story over the centre of the block is devoted to quarters for nurses.

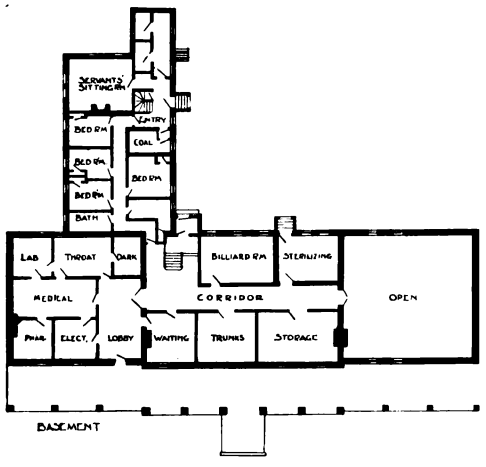
The building is intended for administration purposes, offices, accommodations for trustees and visitors, and for the housing of patients who are able to be up and around.

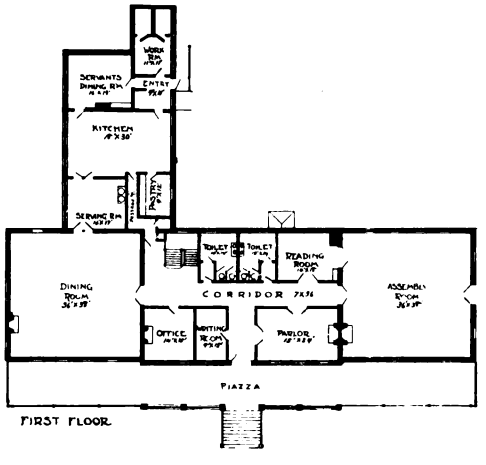
The interior is plastered over metal lath with hard plaster, having round corners and sanitary base, thus eliminating all angles in the endeavor to make it strictly sanitary. The entire building is as nearly fire-proof as possible, with a smooth and simple wood-work and is intended to afford administrative facilities for an institution of one hundred patients, at an estimated cost of $50,000.

Iowa State Sanatorium, Oakdale, Ia., ADMINISTRATION BUILDING (Illustration 24). This is a substantial brick veneered structure 63 feet wide by 70 feet deep, two stories high, with a basement and attic story. The foundations are of stone and the building is trimmed with wood painted white, and surrounded by a veranda on two sides of the first floor, the roof of which is supported by large round wooden columns. The basement contains storage rooms and a dining room for the male help. The main entrance hall on



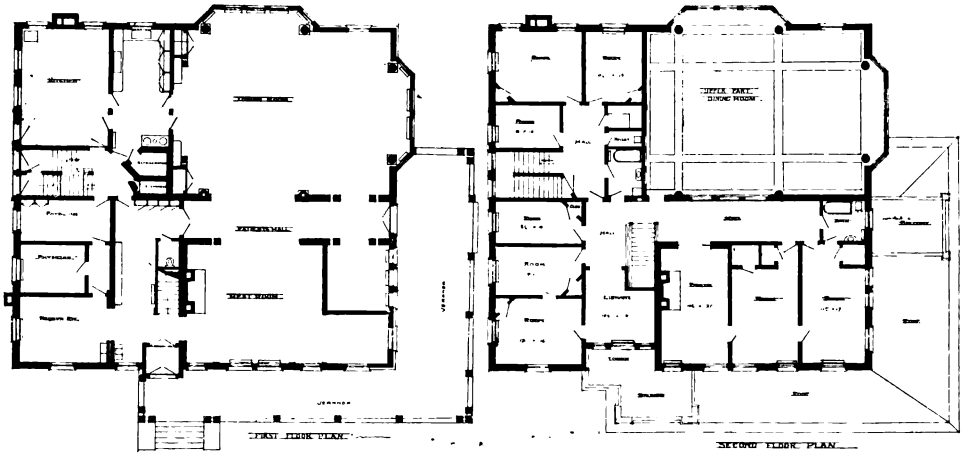




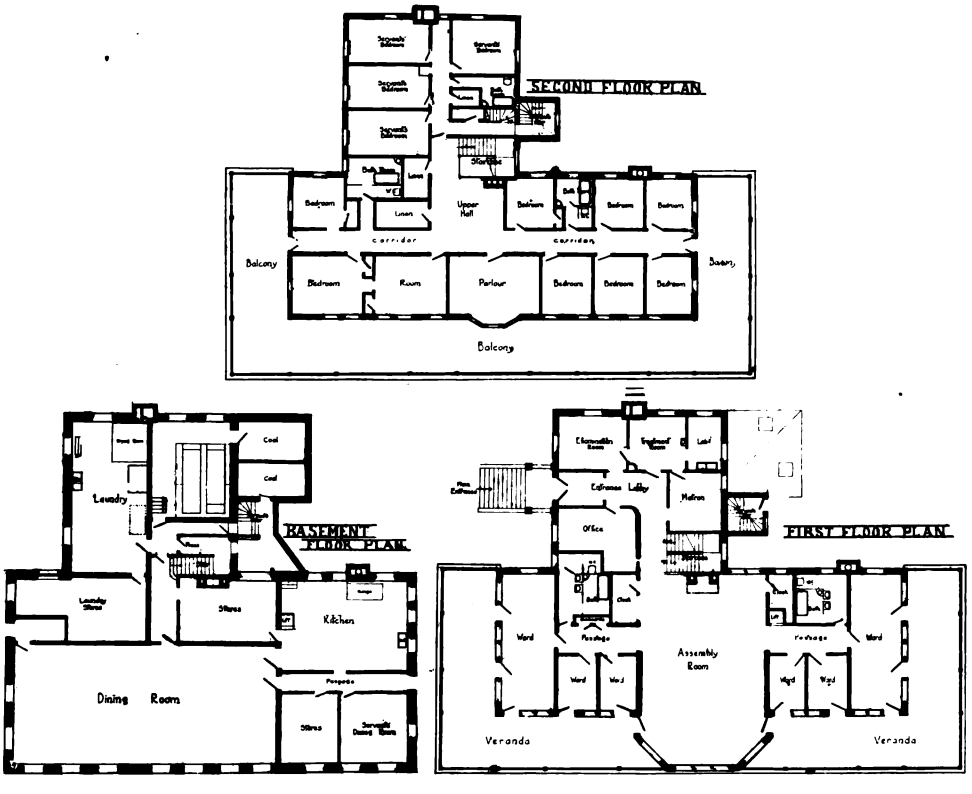


No. 23.—Maine State Sanatorium, Hebron, Me. T. C. Stevens & J. H. Stevens, Architects. Administration Building. View of Front Elevation and Floor Plans. Administrative Capacity, 100 Patients. Estimated Cost, $50,000. (See illustrations 11 and 58 for further description of this institution.)

the first floor is 12 feet wide by 30 feet long, with a physician's suite on one side consisting of a reception room 12 feet wide by 16 feet long, a small examining room 9 feet wide by 12 feet long, a second examination room 8 feet wide by 16 feet long, and a small passage-way 4 feet wide and 9 feet long. On the opposite side of the main hall is a rest-room 22 feet wide by 25 feet long, a small hall 7 feet wide and 22 feet long, running down to the patients' entrance, and a small reception room 10 feet wide by 12 feet long. On the opposite side of the patients' hall and at the end of the entrance hall is a large dining room 30 feet wide by 43 feet long which will seat one hundred and twenty-five persons, a pantry 10 feet wide by 22 feet long, a kitchen 16 feet wide by 22 feet long, stairs to the cellar, a refrigerator, and other conveniences. The second floor, which is divided into quarters



No. 24.—Iowa State Sanatorium, Oakdale, Ia. H. F. LIEBBE, ARCHITECT. ADMINISTRATION BUILDING. VIEW OF FRONT ELEVATION AND FLOOR PLANS. ADMINISTRATIVE CAPACITY, 100 PATIENTS. ESTIMATED COST. $23,000. (See illustrations 29, 84 and 103 for further description of this institution.)



No. 25.—Manitoba Sanatorium, Ninette, Manitoba, Canada. DESIGNED BY DR. D. A. STEWART. ADMINISTRATION BUILDING. VIEW OF FRONT ELEVATION AND FLOOR PLANS. ADMINISTRATIVE CAPACITY, 100 PATIENTS. COST, $33,000. (See illustration 81 for further description of this institution.)

for the nurses and other help, has much less floor area than the first, as the ceiling of the dining room extends above its level. The building has an administrative capacity for one hundred patients, and cost $23,000, but this does not include the laundry and heating plant, which are housed in another structure.

Manitoba Sanatorium for Consumptives, NINETTE, MANITOBA, CANADA, ADMINISTRATION BUILDING (Illustration 25). This building has a basement, two stories and an attic lighted by dormer windows. It is 88 feet along the main front by 30 feet wide and has a rear extension 34 feet wide by 36 feet deep. The basement walls are of rough boulder stone, the ground floor of brick veneer, carried on a steel frame, and the second and third stories of frame construction, finished on the outside with stucco upon metal lath. The front and both ends of the building are considerably broken up by windows and dons and are flanked by a porch twelve feet wide. The basement is wholly above the ground in front and extends out as far as the edge of the porch, thus making it twelve feet deeper than the upper stories. It is divided into a main dining-room 27 feet wide by 52 feet long, a kitchen 19 feet wide by 27 feet long, a servants' dining-room 12 feet wide by 17 feet long, two store rooms about 14 feet wide by 18 feet long, a laundry 16 feet wide by 29 feet long, an ironing room 14 feet wide by 28 feet long and an engine room containing the steam plant for heating the buildings.

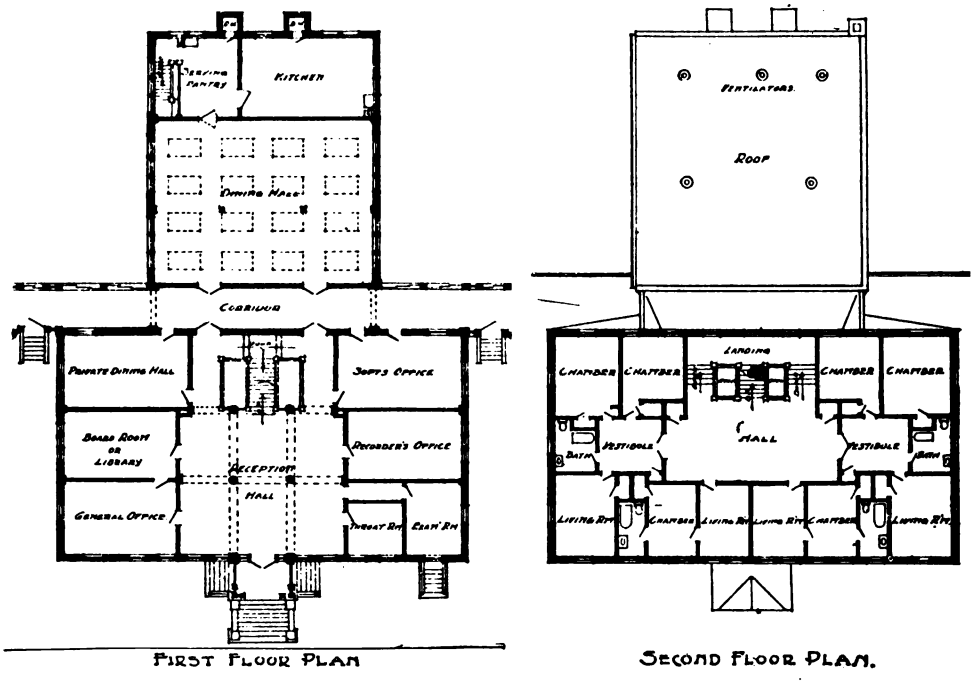
The first floor is divided into a recreation room 28 feet wide by 42 feet long and two infirmary wards 12 feet wide by 30 feet long, one for men and the other for women, two private rooms each 10 feet wide by 12 feet long, two nurses' rooms 12 feet wide by 12 feet long, a business office 12 feet wide by 16 feet long, an examining room 12 feet wide by 15 feet long, treatment room 12 feet wide by 12 feet long, laboratory 8 feet wide by 12 feet long and lavatories, toilets and closets.

The second floor is cut up into rooms for the staff and nurses and the third floor for servants' quarters. The building has an administrative capacity for sixty patients, and cost $33,000, which includes its proportion of the funds expended in heating, plumbing, water and sewage disposal for the entire plant. The pavilions are illustrated under the section on The Lean-to Type of Building.

Indiana State Hospital, Rockville, Ind., ADMINISTRATION BUILDING (Illustration 26). This structure occupies the centre of a group of buildings, illustrated under the section on sites and grouping. It has on the front a basement, two stories and an attic under a mansard roof; in the rear an extension of only one story and basement.

The main portion of the building is 89 feet along the front and 52 feet deep, constructed of brick on a stone foundation. The front basement is divided by a long corridor and contains two storage rooms 17 feet wide by 29 feet long with cement floors, a drug room 12 feet wide by 16 feet long, a store room for drugs 16 feet wide by 24 feet long, and a servants' sitting room 17 feet wide by 31 feet long, connected with baths and toilets. The basement of the rear extension is divided into two large storage rooms, a washroom for servants and a preparation room for vegetables.

The first floor has a large reception hall in the centre 32 feet wide by 36 feet long, running from the front to the rear of the building. On one side is an office 17 feet wide by 26 feet long, and a library 16 feet wide by 26 feet long. On the other is a record office 15 feet wide by 25 feet long and two examination rooms 12 feet wide by 12 feet long. At the far end of the reception hall is a wide stairway to the upper floors with a staff dining hall



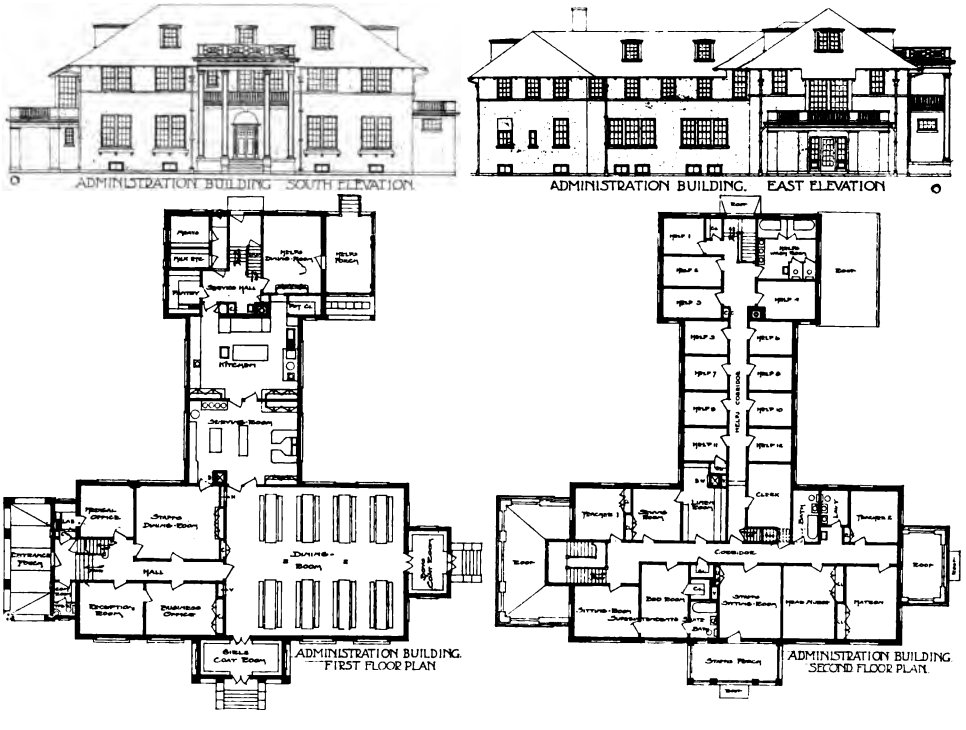
No. 26.—Indiana State Hospital, Rockville, Ind. BRUBAKER & STERN, ARCHITECTS. ADMINISTRATION BUILDING. VIEW OF FRONT ELEVATION AND FLOOR PLANS. ADMINISTRATIVE CAPACITY, 100 PATIENTS. ESTIMATED COST, $50,000. (See illustrations 7, 46 and 51 for further description of this institution.)

17 feet wide by 29 feet long on one side, and a dental room 15 feet wide by 16 feet long, and a barber-shop 14 feet wide by 16 feet long, on the other. At the rear of this portion of the building is a corridor running at right angles to the reception hall and leading to the patients' pavilions at the sides.

Across this corridor is the extension, 60 feet deep by 50 feet wide, one story high. It contains the dining hall 60 feet wide by 40 feet deep; a well lighted and ventilated room, having a high ceiling and provided with a number of small tables each seating eight persons. Behind it is the kitchen and pantry containing a stairway leading to the basement.

The second and third floors of the main building are divided into apartments for the superintendent, staff, nurses and servants, with toilets, closets, baths and other conveniences in each story. It has an administrative capacity for one hundred patients and the estimated cost was $40,000.

The Preventorium for Children, Farmingdale, N. J., ADMINISTRATION BUILDING (Illustration 27). This building is of frame construction, with a shingle roof, excepting the outside walls, which are of hollow tile, covered externally with cement stucco and placed on a concrete foundation. The floors are of yellow pine and all the corridors and rooms having much wear are covered with linoleum held in place by brass strips laid flush with the flooring material.



No. 27.—Preventorium for Children, Farmingdale, N. J. SCOPES & FEUSTMANN, AND WALTER W. JUDELL, ASSOCIATED ARCHITECTS. ADMINISTRATION BUILDING. FRONT AND SIDE ELEVATIONS AND FLOOR PLANS. ADMINISTRATION CAPACITY, 112 PATIENTS. COST, $35,000. (See illustrations 12, 19 and 95 for further description of this institution.)

The front of the building is 103 feet long by 36 feet wide and the rear extension 63 feet long by 27 feet wide. On the first floor in the main section is a business office 12 feet long by 18 feet deep, reception room 12 feet long by 14 feet deep, staff dining room 17 feet long by 20 feet deep and a doctor's office 12 by 12 feet. The main dining room occupies one-half of the front section and is 41 feet long by 31 feet deep. In the rear extension is a serving room 25 feet wide by 19 feet deep, kitchen 25 feet long by 19 feet deep, servants' dining room 13 feet wide by 18 feet deep, and cold storage. The second floor is divided in both sections by corridors. On the front is an apartment consisting of two rooms and bath for the medical superintendent, bedrooms for the head nurse and matron, and a staff sitting room. On the rear are two rooms for teachers, a sewing and linen room, a clerk's room and twelve rooms and a bath for the servants. All the women servants are housed in the administration building, and the men in the third floor of the power house.

The two entrances for the children are arranged to give them direct access to the dining room without going through other parts of the building.

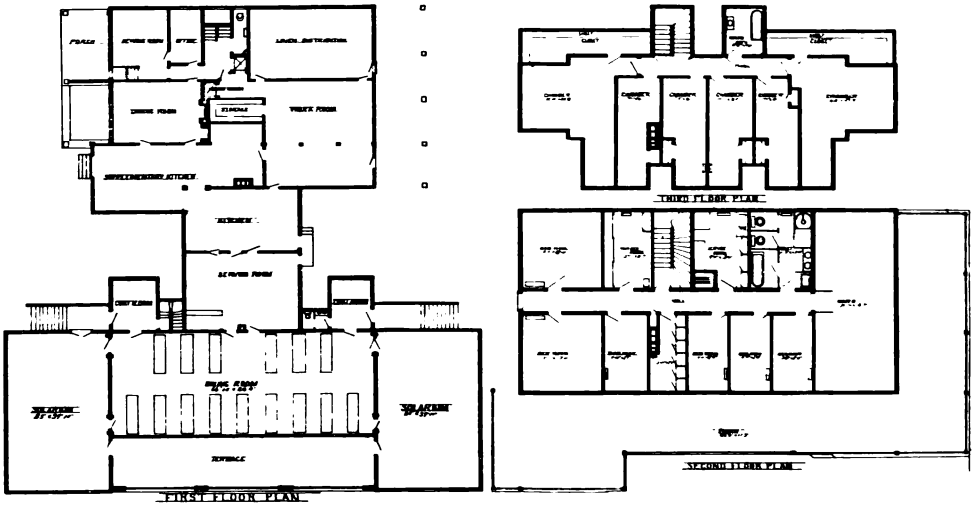
This building for administrative purposes has a capacity for one hundred and twelve children, and was constructed in connection with a reception cottage one quarter mile distant which is a separate unit and has a capacity for thirty children. The cost of the administration building was $25,000.

EXAMPLES OF SERVICE BUILDINGS

The Municipal Sanatorium, Otisville, New York, SERVICE BUILDING (Illustration 28). This was planned to be the centre of a group of lean-tos and cottages at an institution made up of a number of separate units; each to house about one hundred and fifty patients and all to be administered in a general way and about equidistant from a central administration building. The structure illustrated is the service building for the first men's unit and contains a large, commodious dining room, kitchen, two sun parlors, a well arranged infirmary, nurses' and servants' quarters.

It is placed on the side of a hill where the drainage is good, with a foundation constructed of stone which extends to the floors of the first story. As very little excavation was necessary in the front, that part of the basement is mostly above the ground, well-lighted and gives practically an extra story. This is used as a bathing apartment, containing a variety of shower-baths and other modern bathing fittings. The building is divided into two sections connected by a passageway 26 feet wide and 35 feet long in which the kitchen and serving room are placed. The front section, 116 feet long by 40 feet wide, has one story over the basement, of frame construction, covered with shingles. It is divided into a large dining room in the centre, 67 feet long by 24 feet wide, seating from 120 to 150 persons, and two solaria 39 feet long by 25 feet wide for reading and amusement purposes connected by a terrace in the front of the dining room. The solaria and terrace are enclosed by glass and sash windows which can be and usually are pushed up out of the way, leaving the openings entirely clear.

The rear of the building is for all practical purposes a separate structure 66 feet long by 32 feet wide, and as the hill at this point has a steep slope, the floor of the first story is close to the ground and contains the storage, work rooms and other apartments needed by the service staff. The second floor is used as an infirmary and is divided through the centre by a long hall four feet wide which opens at one end into a ward 27 feet wide by 60 feet long. On one side of the hall is a two-bed and four single-bed rooms and a locker

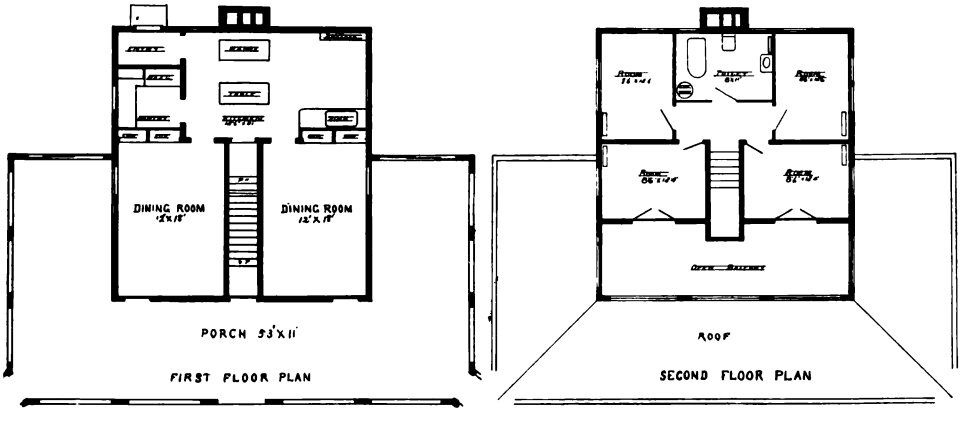


No. 28.—Municipal Sanatorium, Otisville, N. Y. JOHN B. VAN PELT, ARCHITECT. DESIGNS OF THE DEPARTMENT OF HEALTH. SERVICE BUILDING AND INFIRMARY FOR ONE SECTION OF THE INSTITUTION. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLANS. SERVICE CAPACITY, 250 PATIENTS. ESTIMATED COST, $35,000. (See illustrations 14, 59, 60, 85, 94 and 101 for further description of this institution.)

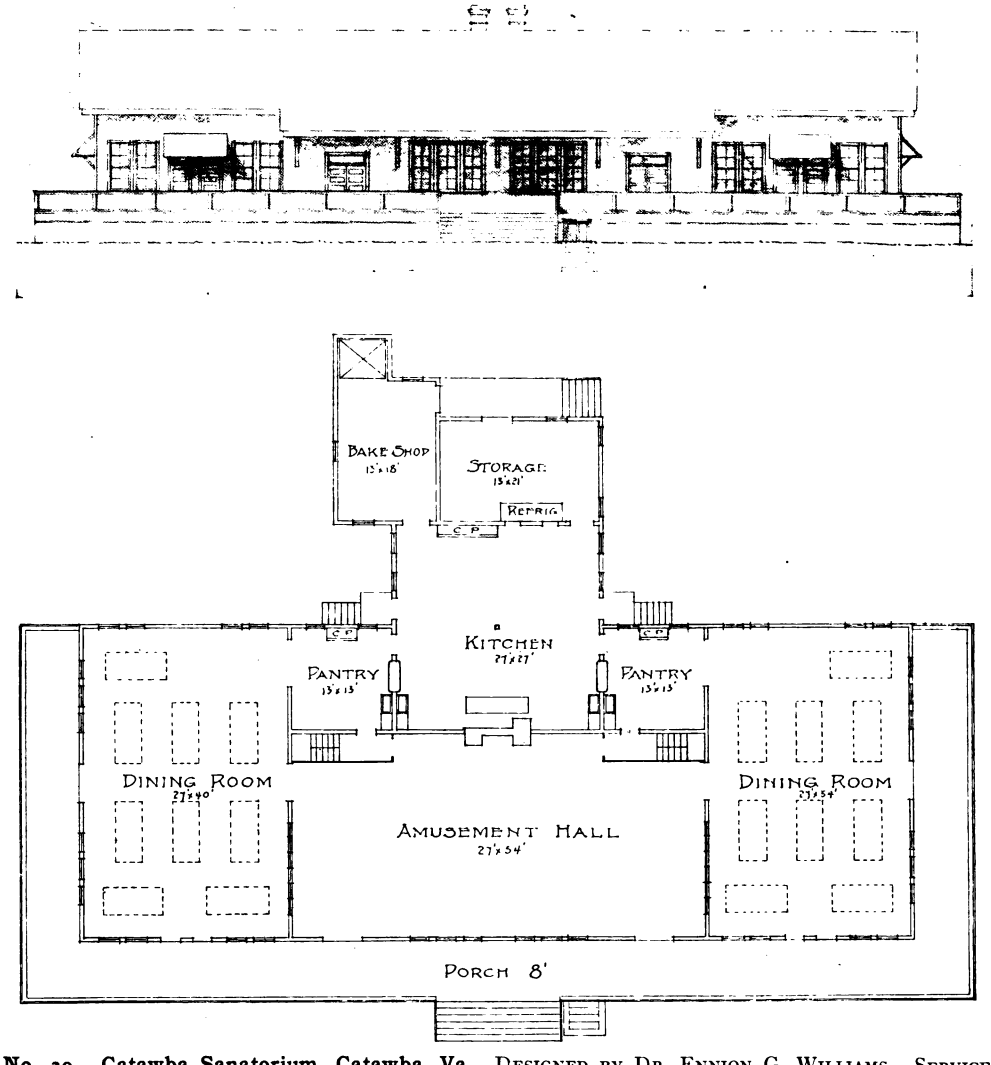
room. On the other is one two-bed room, a stairway, baths, toilets and a nurses' room. These are surrounded on two sides by large open verandas upon which all beds can be rolled both from the ward and the private rooms.

The third story under a slanting roof is cut up into two dormitories, four single rooms, toilets and closets for the use of the servants. The service capacity is for one hundred and fifty patients at an estimated cost for construction of $35,000.

Iowa State Sanatorium, Oakdale, Ia., SERVICE COTTAGE (Illustration 29). This building was erected to provide a kitchen and dining room for an infirmary group consisting of three cottages all connected by a covered corridor and built on the lines of



No. 29.—Iowa State Sanatorium, Oakdale, Ia. DESIGNED BY DR. H. E. KIRSCHNER. H. F. LIEBBE, ARCHITECT. SERVICE BUILDING FOR INFIRMARY GROUP OF COTTAGES. VIEW OF FRONT ELEVATION AND FLOOR PLANS. SERVICE CAPACITY, 20 PATIENTS. ESTIMATED COST, $6,000. (See illustrations 24, 84 and 103 for further description of this institution.)



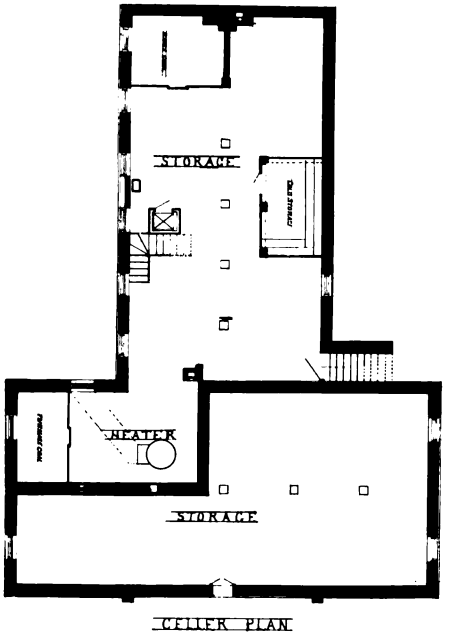
No. 30.—Catawba Sanatorium, Catawba, Va. Designed by Dr. Ennion G. Williams. Service Building, Containing an Amusement Hall. Front Elevation and Floor Plan. Service Capacity, 70 Patients. Estimated Cost, $10,000. (See illustrations 17, 69 and 80 for further description of this institution.)

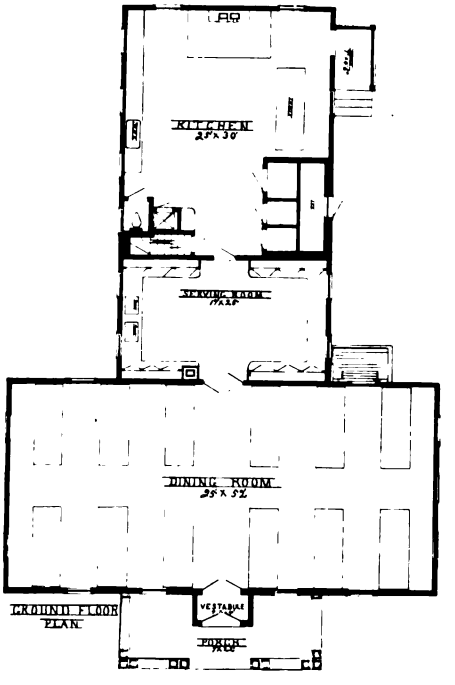
the incipient patients' cottages at the Iowa State Sanatorium illustrated in the section on The Cottage Type of Building. It is of frame construction on a stone foundation with two stories and a cellar. The first floor is divided into three rooms, a large kitchen in the rear 21 feet wide by 13 feet deep, with a small pantry, refrigerator and cupboards back of it, and two dining rooms 12 feet wide by 18 feet deep on the front, divided by a stairway leading to the upper story. This floor has a porch 11 feet wide by 53 feet long across the front with an extension fifteen feet deep to the rear on each side of the building and of the same width.

The second floor is divided into four bedrooms for servants, all 8 feet 6 inches wide by 12 feet 6 inches long, a toilet and bath 8 feet wide by 11 feet long and a sleeping porch

or loggia 8 feet wide by 29 feet long, which is part of the main structure, being placed back under the roof of the building.

The service cottage is unusual and interesting because of the wide extent of its porches and the simplicity of its floor plans, with a capacity for 20 patients, at a low cost estimated at $6,000.





No. 31.—New Haven County State Tuberculosis Sanatorium, Meriden, Conn. FOOTE & TOWNSEND, ARCHITECTS. SERVICE BUILDING. VIEW OF FRONT ELEVATION AND FLOOR PLANS. SERVICE CAPACITY, 122 PATIENTS. ESTIMATED COST, $15,000. (See illustration 79 for further description of this institution.)

Catawba Sanatorium, Catawba, Va., SERVICE BUILDING (Illustration 30). This building is of frame construction, raised on stone piers. It is 108 feet long by 54 feet wide, with a rear extension 30 feet wide by 30 feet deep and a porch eight feet wide on the front and sides. It is divided into two dining rooms 27 feet wide by 40 feet deep at the ends of the building and a large amusement hall 54 feet wide by 27 feet deep between them in the centre. This hall has a large fire-place and can be thrown open in connection with the two dining rooms by raising windows in the walls between them. The building has six entrances on the veranda and the front and sides are well broken up by windows in order to give the patients open air dining and sitting rooms. Directly behind the hall is the kitchen 27 feet wide by 37 feet deep, housed partly under the main roof and partly in the rear extension. The kitchen is connected to each dining room by pantries or serving rooms 13 feet wide by 13 feet deep and has in the rear a bakery 13 feet wide by 18 feet deep, a store room 21 feet wide by 13 feet deep, and a refrigerator.

This plan for a service building is to be commended and well illustrates the reasons for constructing a separate structure to house this department, as it provides under a roof open air dining rooms, with cross-ventilation and light from every direction. It has a service capacity for seventy patients at an estimated cost of $10,000.

New Haven County Tuberculosis Sanatorium, Meriden, Conn. (Illustration 31). This building is one story with a cellar, of frame construction, on a stone foundation. It is constructed in two sections, the front being 53 feet wide by 26 feet deep. The cellar extends under the entire building with a floor laid in cement and is used for storage with the exception of a room where the heating plant is installed. The dining room occupies the entire front of the building and is 52 feet wide by 25 feet deep. It is entered through a vestibule from a porch 8 feet wide by 22 feet long and is furnished with twelve tables, seating ninety-six persons. The room is well lighted and ventilated, but is not an open air pavilion. At its rear in the extension is a serving room 25 feet wide by 15 feet deep, and behind this the kitchen 25 feet wide by 30 feet deep, furnished with a large refrigerator, a small toilet, dumb-waiter to the storage rooms below and connected with the cellar by stairs, which leads to a cold storage plant. It has a service capacity for one hundred and twenty-two patients at an estimated cost of $20,000.

SECTION III

Administration Buildings and Patients' Quarters Combined

SECTION III

Administration Buildings and Patients' Quarters Combined

The Need for Combination Buildings

The rapid growth of public opinion in regard to the necessity of caring for and isolating the advanced tuberculosis patient and the growing belief that the spread of this disease cannot be checked without the removal of advanced cases from the homes of the poor and ignorant, has caused a continually increasing number of hospitals to be constructed during the past two years, designed to house the entire institution under one roof. It is claimed for this style of building that it is possible to economize on the installation of the plumbing, heating, and administrative arrangements, that it concentrates the work, and is particularly good for city use, where property is valuable and a site cannot be obtained at a reasonable cost for the erection of the pavilion type of hospital, or one-story lean-tos and cottages spread over a large area of ground.

These buildings may be used for housing either incipient or advanced cases of tuberculosis, and are planned and constructed on lines conforming in many ways to the needs of a general hospital. As they are intended usually for the service of small communities and are often placed on the outskirts or within towns or cities the site selected should be near the line of an electric car system, with enough land to allow of the free circulation of air on all sides of the building. Two entrances should be provided when possible, one for the staff, patients and their friends, and the other for merchandise and service.

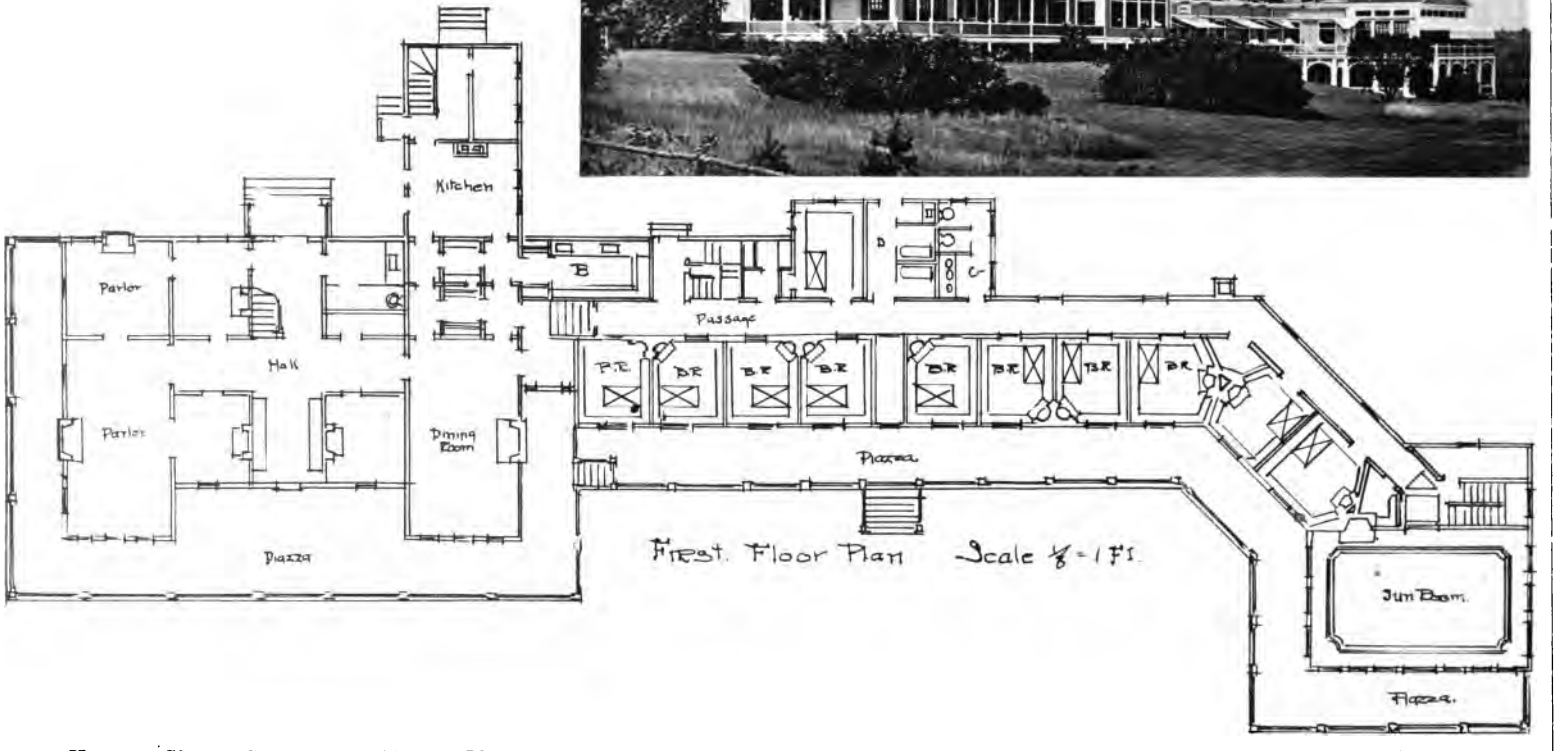
Planning Combination Buildings

In designing these buildings there should be provided for all advanced cases, single bedrooms or rooms with not more than two beds in each, and for incipient cases small wards of not more than six patients or rooms for two patients each. Every patient housed under the main roof should have two thousand cubic feet of air space and a porch area eight feet wide by ten feet deep, or at least large enough for a bed, reclining chair and table.

As fire protection is compulsory in many cities it is suggested that reinforced concrete, brick, terra cotta or concrete tile construction with reinforced concrete floors be adopted, as buildings erected in this manner are practically non-combustible. The structure should be wired for bells or telephonic communication when it is wired for lighting, as bell calls or telephones should be installed in all rooms to be used by patients. The walls and ceilings should be finished in hard plaster, painted and varnished. The corners in the wall angles and at the ceiling and floor should be rounded. Light colors may be used on the walls instead of a dead white; in fact, a harmonious color scheme throughout the entire building is an advantage, as it is one of the means for making patients happy and contented. A ventilating system is not necessary in these buildings, but all the wall space possible should be used for windows. The floors of the interior, except the toilets,

No. 32.—Eastern Maine Hospital, Bangor, Me. T. C. & J. H. Stevens, Architects. Illustrating a Method of Protecting a Sleeping Porch with Heavy Wire Netting. Useful when a Porch Faces a Street or to Prevent Patients from Leaving without Permission.

No. 33.—United States Hospital for the Insane, Washington, D. C. Showing a Method of Inclosing a Sleeping Porch with Swinging Sash Frames; Useful for City Hospitals with Porches Having Various Exposures.



No. 34.—Sharon Sanatorium, Sharon, Mass. DESIGNED BY DR. VINCENT Y. BOWDITCH. CAPACITY, 23 PATIENTS. ESTIMATED COST, $40,000.

baths, laundry and kitchen, should be of hard wood, treated by oil and wax, or ordinary narrow board floors, covered with battle-ship linoleum. Other floors which come in contact with an unusual amount of water should be of terrazzo, cement, tile, or of one of the patent composition floorings. All the doors and passageways should be wide enough for the easy rolling of the beds through them; that is, not less than three feet six inches. There should be no door sills or panels in the doors; and all the interior finish around them and the windows should be placed flush so as not to produce projections or corners which will catch the dust. The building should be constructed on the sanitary principles laid down for general hospitals, and the rooms for advanced cases and all the porches screened with wire netting which can be removed during the cold weather.

The examples of building and floor plans given are not all model arrangements, but each one offers some suggestions, not found in the others, which may be of use to designers of this class of institutions.

Rooms for Administrative Purposes

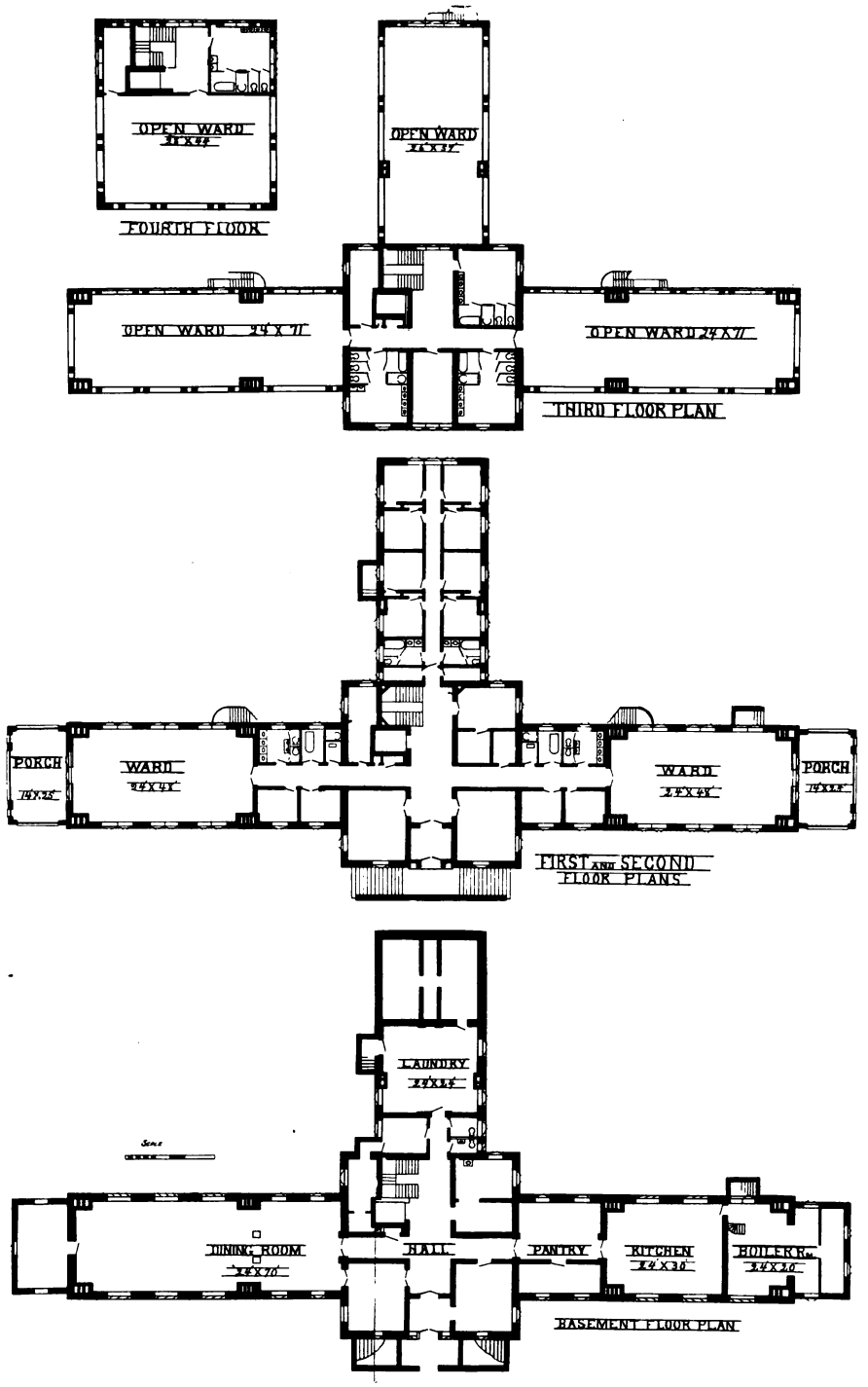
The building should contain for administrative purposes the following rooms:

Dining Room for Patients
Dining Room for Staff
Dining Room for Servants
Kitchen
Diet Kitchens
Bakery
Serving Room
Dish Closet
Cold Storage
Physician's Office
Special Treatment Room
Waiting Room
Laboratory
Drug Room
Business Office
Sitting Room
Library
Superintendent's Quarters
Physician's Quarters
Nurses' Quarters
Servants' Quarters
Sewing Room
Linen Room
Store Rooms
Sink Rooms
Bath Rooms
Toilets
Laundry
Disinfecting Room
Crematory
Morgue
Autopsy Room
Heating Plant
Workshop
Coal Storage

EXAMPLES OF COMBINATION BUILDINGS

Sharon Sanatorium, Sharon, Mass. (Illustration 34). This is one of the oldest buildings in America constructed for the open air treatment of tuberculosis and was planned to be an administration building and patients' quarters combined. Its continuous use for fifteen years has demonstrated its convenience for housing incipient and moderately advanced cases. Any one planning to build a sanatorium and desiring to have a complete unit under one roof, particularly if there is a farm house or country residence on the site selected, will find this a convenient design to adopt, as the original structure can be used for administrative purposes and an extension added on one or both sides for patients' quarters. By using this method it is possible to build a comparatively cheap sanatorium if the patients' quarters are constructed in an economical way. The extension in the illustration runs from the dining-room and includes the sun parlor, with the toilets, baths, and closets, in the rear of the hall. The sleeping porch is wide

No. 35.—Tuberculosis Hospital, Washington, D. C. Designed by Dr. George M. Kober. Frank Miles Day & Brother, Architects. View of Front Elevation. Basement Contains Service Department. The First and Second Floors are for Advanced Cases; the Third and Fourth Floors are Open Wards for Incipient Cases. Capacity, 120 Patients. Cost of Construction and Equipment, $100,000.



No. 36.—Tuberculosis Hospital, Washington, D. C. Designed by Dr. George M. Kober. Frank Miles Day & Brother, Architects. Floor Plans. Capacity, 120 Patients. Cost, $100,000.

enough to give plenty of room for the patients to move around at the sides of the beds, and is protected, when necessary, from the sun and rain by a canvas awning which can be rolled up out of the way, leaving the porch uncovered. The doors from the private rooms opening on the porch are made wide enough for the beds to pass through them.

It is suggested that an improvement to this building can be made by putting in Dutch doors below all windows opening on the porches and by placing a glass roof under the canvas curtain which protects and covers the sleeping balconies, as such a roof would not shut out the light from the rooms when the curtains are drawn back and would be more durable than canvas alone. Also, that the bedrooms opening on the porches can be constructed of a smaller calibre, as the beds are chiefly out of doors and the rooms are used merely for dressing. The building has a capacity for twenty-five patients. The estimated cost was $45,000.

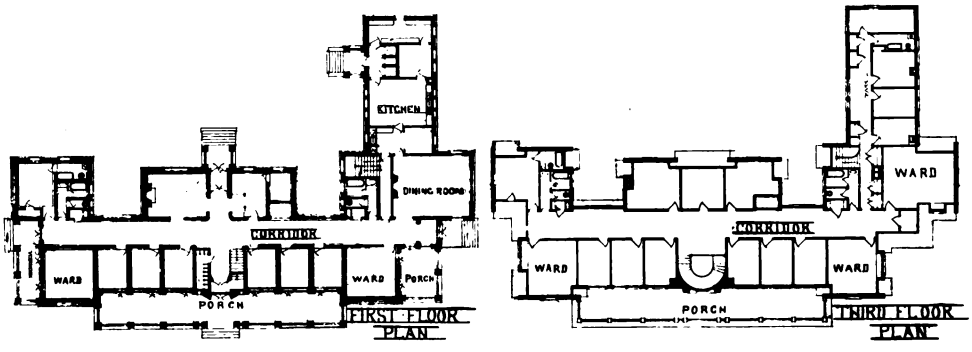
The Tuberculosis Hospital, Washington, D. C. (Illustrations, 35 and 36). This hospital was built at a remarkably low cost, and is interesting in the way it is planned to house advanced and incipient, white and colored, male and female patients; each group in a separate wing or on a different floor. The hospital is planned to provide accommodations in separate wards on the first floor for white and colored males who are in the later stages of the disease; and the second floor is arranged in the same manner for white and colored females. The incipient cases of both sexes, white and colored, are housed in open-air wards on the third and fourth floors. These open wards are roof gardens with casement windows on the north, but are entirely open on the east, south and west sides.

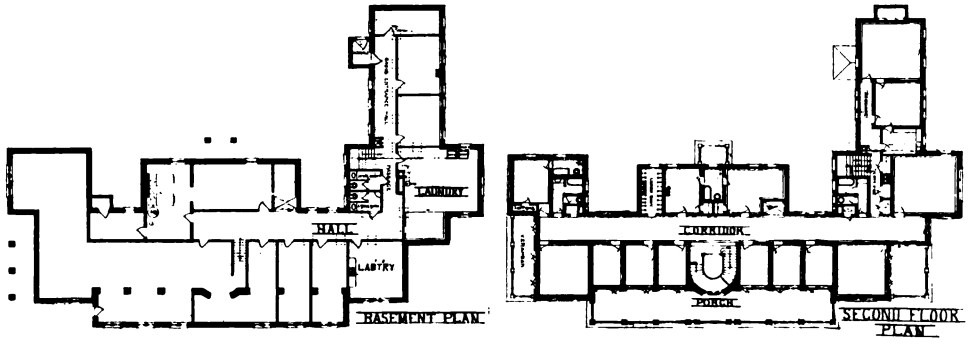
A careful study of the arrangement of the wards, noting the allotment of floor space to the different classes of patients, is interesting. The length of the building along the front is two hundred and ten feet by twenty-five feet wide through the wards, and fifty feet through the centre. The side extensions are eighty-two feet long and the rear extension on the upper floors is fifty feet long, but as it runs into the side hill it has not been excavated the entire length in the basement. The basement contains a large dining room, kitchen, store rooms, boiler rooms, refrigerator, postmortem room, and morgue.

The arrangement of the first and second floors is the same, the side wards being 48 feet long by 25 feet wide, the sun parlors 25 feet deep by 14 feet wide, and the rest of the floor space divided into rooms for offices, toilets, diet kitchen, and the other accessories used in a general hospital.

The wings and extension on the third floor are used as three large open-air wards, two 71 feet long by 24 feet wide, and one 57 feet long by 25 feet wide. The centre of the building on this floor is divided in much the same manner as the lower stories, but the rooms are used as toilets and baths for the patients and as apartments for the nurses. Over the main part of the building on the fourth floor is an open-air ward, 28 feet wide by 44 feet long, with toilets, baths, and dressing rooms opening into it from the rear.

The building is a substantial brick structure, well finished on the interior in hard wood, giving a good substantial appearance, and there is a commodious electric elevator. The institution is well worth a visit, not only because of its unique arrangement, but also because it will offer many suggestions to those who have to solve the problem of housing tuberculous patients in large, congested cities. It has a capacity of one hundred and twenty beds, and cost to erect and furnish, $100,000.





No. 37.—Lady Grey Hospital, Ottawa, Canada. WEEKS & KEEFER, ARCHITECTS. VIEW OF FRONT ELEVATION AND FLOOR PLANS. CAPACITY, 45 PATIENTS. COST, $60,000.

The Lady Grey Hospital, Ottawa, Canada (Illustration 37). This building was erected by the Ottawa Anti-tuberculosis Association and furnished by the Daughters of the Empire, then handed over as a gift for the people to be maintained by the city. It is situated within the western limits of Ottawa on an elevated site, with sloping ground beside a beautiful grove of mature maples forming a little park with seats and hammocks in the shade for the patients during the hot days of summer.

The building is a three story structure with a large basement constructed of hard local red brick, laid in white mortar, on a concrete foundation, with Indiana limestone trimmings, following closely the modern English residential style of architecture. It faces southwest and has a number of large verandas screened by wire against insects, which open into the different wards by wide doors through which the beds are wheeled. The main front of the building is 130 feet long by 45 feet wide, and the rear extension is 41 feet deep by 21 feet wide.

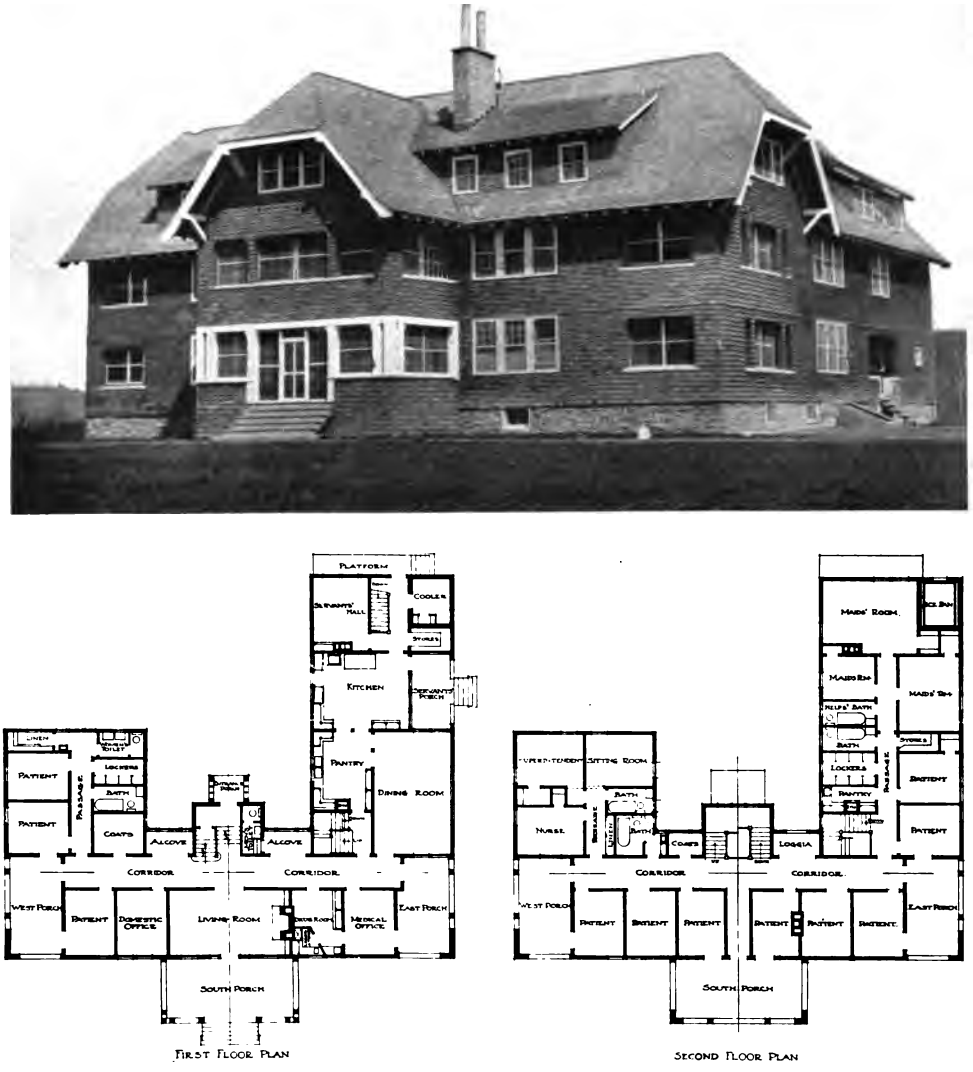
The basement contains a laundry 22 feet wide by 20 feet deep, drying room 10 feet wide by 8 feet deep, laboratory 12 feet wide by 14 feet deep, storage for furnace coal 20 feet wide by 12 feet deep, furnace room for two boilers for the heating plant 12 feet wide by 20 feet deep, and a room for elevator machinery 6 feet wide by 8 feet deep.

The main portion of the first floor is divided through its entire length by a corridor eight feet six inches wide, having on the front a veranda 72 feet long by 12 feet wide. Between the veranda and the corridor are six single rooms 10 feet wide by 12 feet deep and at each end of the corridor on the front are two wards of the same size 18 feet wide by 18 feet deep, for three patients each, with a small veranda extending out from them at the sides of the building, the one on the right being 8 feet wide by 22 feet long and the one on the left 10 feet wide by 14 feet long.

The entrance hall is in the centre of the building 14 feet wide by 15 feet deep, with the main stairway leading up on one side and a locker room on the other. On the rear of the corridor is the patients' dining-room 22 feet wide by 20 feet deep, a doctor's office 10 feet wide by 14 feet deep, an examination room 6 feet wide by 8 feet deep, a parlor 16 feet wide by 12 feet deep, a nurses' room 10 feet wide by 14 feet deep, and toilets and baths for both men and women. In the rear extension on the right of the building, back of the dining-room, is a kitchen 22 feet wide by 14 feet deep, servants' dining-room 10 feet wide by 10 feet deep, serving room, pantry, refrigerator room and store rooms.

The second floor is arranged in the same way as the first, with verandas on the front and sides of the same dimensions, six single rooms and two wards in front of a corridor running the entire length of the building, and in its rear a large ward over the dining room 22 feet wide by 20 feet deep, toilet and baths for women and men, a matron's room 14 feet wide by 18 feet deep, two nurses' rooms 14 feet wide by 12 feet deep, and a locker room for patients. In the extension is a diet kitchen 9 feet wide by 6 feet deep, a nurses' dining room 14 feet wide by 13 feet deep, a nurses' sitting room 21 feet wide by 21 feet deep, and a small hall three feet wide, running into the main corridor at a right angle.

The third floor also has the same general arrangement planned for the lower floors, except that there are no side verandas and the extension is divided into bedrooms and a toilet for the servants. The building has a capacity for forty-five patients, is heated by steam, has an elevator and dumb waiters, and cost $60,000.



No. 38.—Lake Edward Sanatorium, Lake Edward, Province of Quebec, Canada. SCOPES & FEUSTMANN, ARCHITECTS. VIEW OF FRONT AND SIDE ELEVATION, FLOOR PLANS. CAPACITY, 26 PATIENTS. COST, $26,000.

Lake Edward Sanatorium, Lake Edward, Province of Quebec, Canada (Illustration 38). This building is placed on a stone foundation two feet thick, and is of frame construction, with a shingled exterior. In order to protect the interior from cold as much as possible the walls are constructed in layers from the outside in, as follows: shingles, paper, siding, paper, siding, studs, wooden lath, plaster. The floors are hard wood throughout. All patients are provided with porch space and can be wheeled from their rooms to the veranda assigned to them.

The building is 87 feet long by 25 feet wide, with two extensions in the rear, one 28 feet wide by 19 feet deep, and the other 28 feet wide by 54 feet deep; each porch was designed as a loggia, and is a part of the structure under the main roof.

The first floor of the main section is divided as follows: Beginning on the left of the illustration, first a loggia, called the west porch, 19 feet wide by 10 feet deep, then a patients' room 9 feet wide by 12 feet deep, an office 9 feet wide by 12 feet deep, a living room 23 feet wide by 12 feet deep (from which extends in front a loggia or the south porch 24 feet wide by 11 feet deep), a drug-room 9 feet wide by 12 feet deep, a medical office 9 feet wide by 12 feet deep, and a loggia (the east porch) 19 feet wide by 10 feet deep. At the rear of these apartments is a corridor six feet wide, connecting the two corner porches and behind it is the main entrance and stairway to the second floor, a men's toilet 9 feet wide by 4 feet deep, and two alcoves 9 feet wide by 4 feet deep.

On the west end of the building in the rear is the smaller extension, divided down the centre by a hall four feet wide, opening into the main corridor. On one side of the passage are two patients' rooms, one 10 feet wide by 12 feet deep, the other 9 feet wide by 12 feet deep, and a linen room. On the other side is a coat room 9 feet wide by 7 feet deep, a bath room 5 feet wide by 10 feet deep, a locker room 5 feet wide by 10 feet deep, and the toilet room for women 5 feet wide by 8 feet deep.

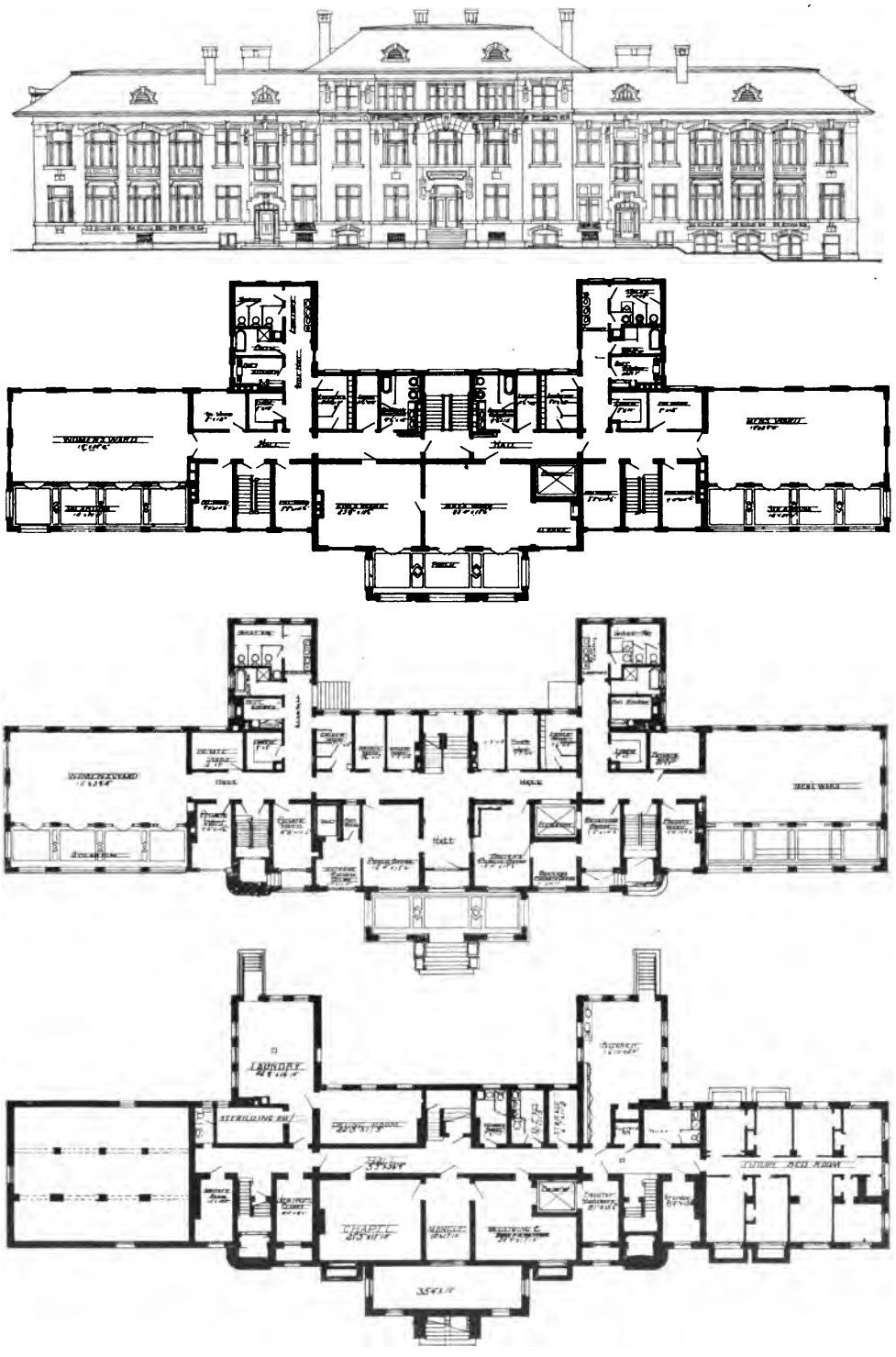
In the extension on the east of the building is a dining-room 14 feet wide by 23 feet long, a pantry 11 feet wide by 15 feet long, a kitchen 15 feet wide by 18 feet long, a servants' loggia or porch 7 feet deep by 14 feet wide, a servants' sitting room 10 feet wide by 14 feet long, the service and cellar stairway, refrigerator and store room.

On the second floor the building is divided by a corridor practically in the same way as on the first, with six rooms each 9 feet wide by 12 feet deep, on the front for patients, and an east, west and south loggia of the same dimensions as those on the first floor, the south porch being reached by a small hall four feet wide, in the centre of the building. In the rear of the corridor is a small loggia on one side of the main stairway and a coat room on the other. The west extension is divided into a bedroom and sitting room for the superintendent, a nurses' sleeping room, closets, toilets, baths and a linen cupboard. The east extension is divided down the centre by a hall opening into the main corridor with two rooms for patients, a store room, maid's room and a refrigerator room on one side, and a pantry, lockers, baths and two maids' rooms on the other.

The third floor has also the same general arrangement. Six single rooms for patients on the front with a corridor in their rear, an east, west and south loggia, all somewhat smaller than those on the floors below, two rooms for patients in the west and five in the east extension, together with baths, toilets, and lockers, placed at convenient points.

The building is a complete institution in itself, supplying each patient with an individual room. There is a heating plant in the cellar, and electricity is generated for lighting purposes on the premises. The capacity is twenty-six beds, housing all classes of patients, at a cost for construction of $26,000, or $1,000 per patient.

Franklin County Tuberculosis Hospital, Columbus, Ohio (Illustration 39). This building is constructed of brick on a stone foundation, in one long block with two small rear extensions. It is two stories high and has a basement under the entire building, and a third story over the centre. The building is one hundred and ninety-six feet along the front and for convenience of description can be divided into five sections: the centre or administration block is 60 feet long by 41 feet wide, the sections on each side, including the extensions, are 28 feet wide by 60 feet deep, and beyond these are ward sections 40 feet long by 32 feet wide. The general plan of each floor is alike in the centre of the building, with rooms in the front and back divided by a corridor which ends in wards.



No. 39.—Franklin County Tuberculosis Hospital, Columbus, Ohio. HOWARD & MERRIAM, ARCHITECTS. FRONT ELEVATION AND FLOOR PLANS. CAPACITY, 100 PATIENTS. ESTIMATED COST, $80,000.

The central block contains in the basement, on the front a chapel 16 feet wide by 18 feet deep, a morgue 10 feet wide by 18 feet, receiving room in connection with the morgue 23 feet wide by 18 feet deep, and the elevator shaft; on the rear a drying room 23 feet wide by 12 feet deep, a stairway, toilets, and a storage room.

The first floor is divided in the centre by the entrance hall ten feet wide, which opens at right angles into the main corridor, with the stairway to the upper stories opposite the door. On the front are the public offices, doctor's office, and examining rooms. On the rear are four private rooms and two locker rooms.

The second floor is devoted to the children's department. Over the executive offices in the front are two wards 23 feet wide by 18 feet deep, one for girls, the other for boys. Opposite on the rear are the locker rooms, linen rooms and toilet rooms in connection with them.

The extension sections are also divided by the corridor which runs through the central block and that portion of them not under the main roof is twenty-four feet deep by twenty feet wide. In the basement on one side in the rear is the laundry, and on the other the kitchen, both 22 feet deep by 17 feet wide. In the front are the service stairways, janitor's department, machinery room and a sterilizing room. On the first and second floors are the toilets and baths, private rooms and diet kitchens. On the third floor in the rear are two wards, 17 feet wide by 22 feet deep, one for men and the other for women. In the front are the toilets and baths and linen rooms.

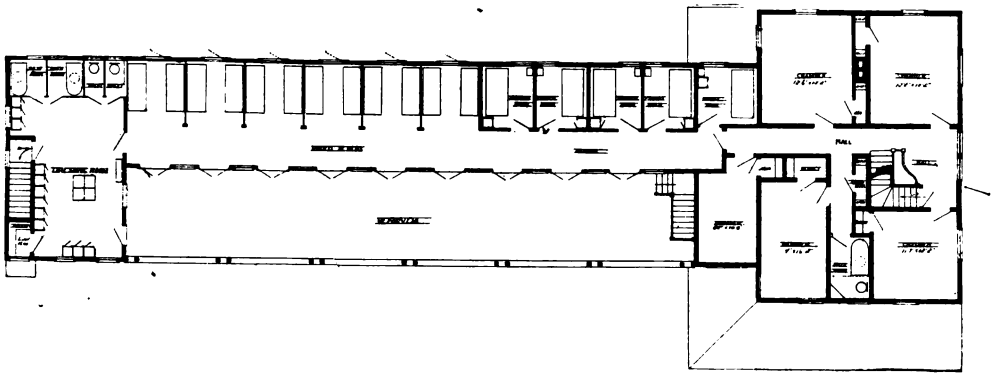
The ward sections, 20 feet wide by 39 feet long, are not used in the basement, but on the first and a second floors are alike, having in front an enclosed porch or solarium 9 feet wide by 39 feet long.

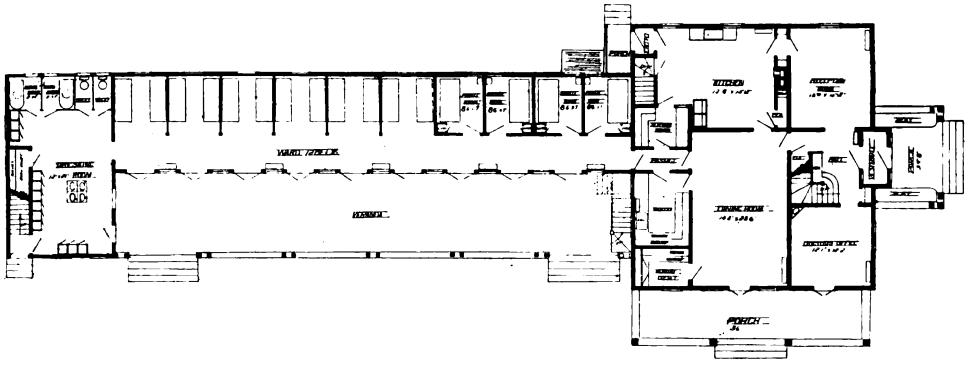
This building is intended for all classes of cases and is designed to bring under one roof an entire plant with a capacity of one hundred patients at a cost of $80,000.

County Tuberculosis Sanatorium, Hartford, Conn. (Illustration 40). This is a small building, consisting of a remodeled farmhouse used for administration purposes to which has been added a rear extension for housing the patients. The building is of frame construction, two stories high, the original structure being 40 feet wide by 36 feet deep and the extension 93 feet long by 28 feet wide, including the veranda. There is a cellar under the main building but no excavation under the extension except for a tunnel carrying the steam pipes from the cellar in the administration building to the dressing and toilet rooms.

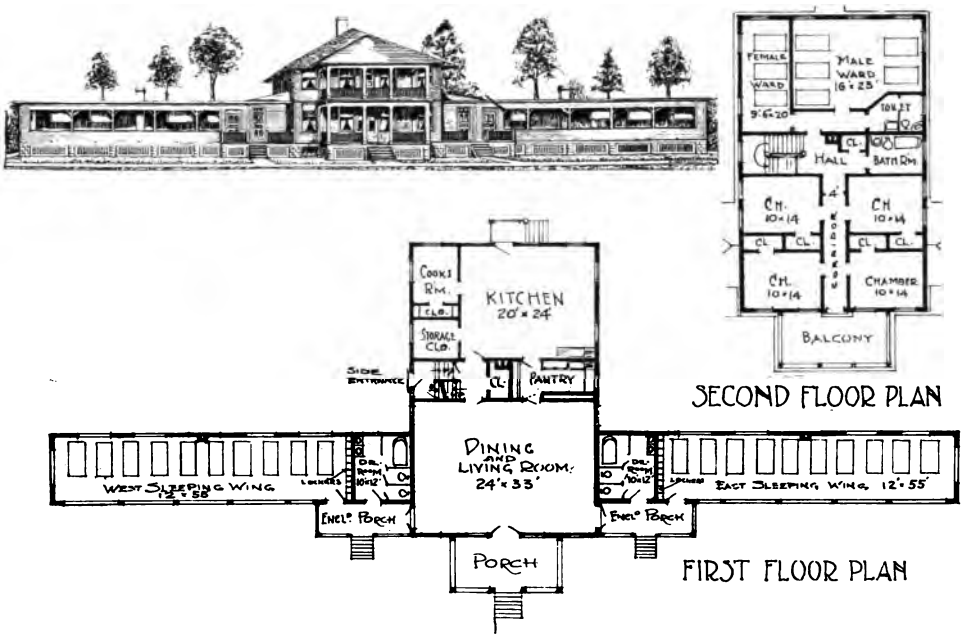
The first floor of the administration section is divided into a reception room 15 feet wide by 12 feet deep, an entrance hall 11 feet wide by 12 feet deep and an office 12 feet wide by 12 feet deep. At the rear of these rooms is a dining room 14 feet wide by 23 feet long and a kitchen 12 feet wide by 15 feet long, connected with a serving room, pantry, closet and stairway to the cellar. On this floor a passageway three feet wide connects the dining room with the patients' quarters which are divided into four single rooms 7 feet wide by 8 feet deep and a ward 48 feet long by 14 feet deep cut up into six cubicles eight feet wide. This ward opens on to a veranda twelve feet wide and into a dressing room at the far end of the extension 16 feet wide by 26 feet deep, containing toilets, baths and lockers.

The second floor of the administration section is divided into four bedrooms, two 12 feet wide by 15 feet long, one 9 feet wide by 16 feet long and one 11 feet wide by 12 feet long, a stairway and a hall connecting it with the extension. This floor of the patients' quarters is arranged in the same manner as the first floor, with the exception of the addition





No. 40.—Hartford County State Tuberculosis Sanatorium, Hartford, Conn. FOOTE & TOWNSEND, ARCHITECTS. VIEW OF FRONT AND SIDE ELEVATIONS AND FLOOR PLANS. THIS IS A REMODELED FARMHOUSE, WITH AN OPEN WARD EXTENSION IN THE REAR. CAPACITY, 33 PATIENTS. ESTIMATED COST, $15,000.



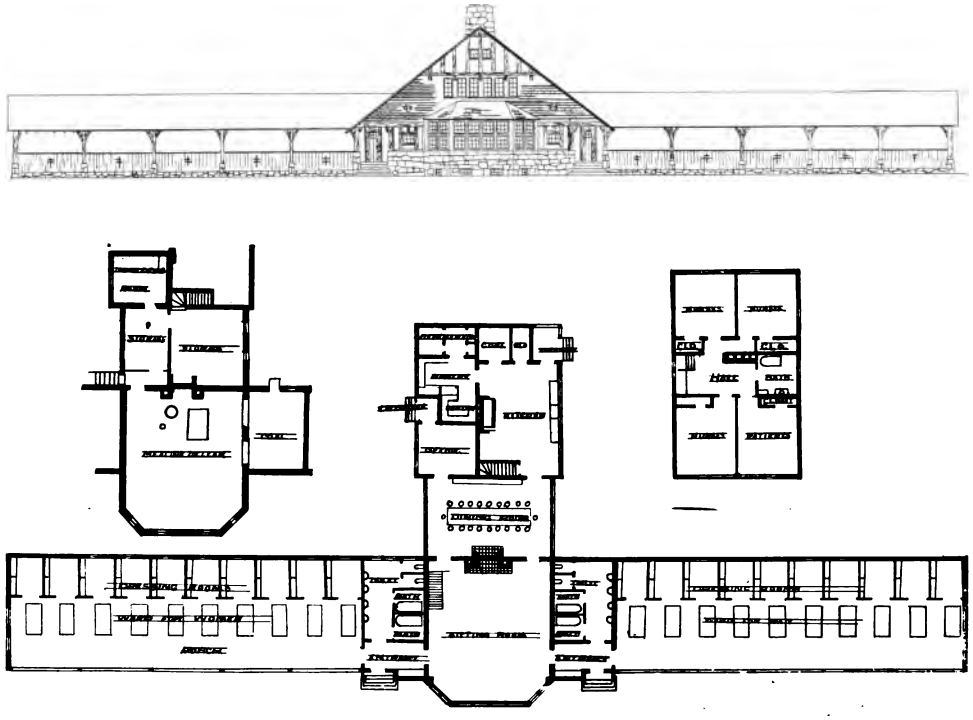
No. 41.—Cuenca Sanatorium, Bass Lake, Minn. ALFRED H. WHEELER, ARCHITECT. ELEVATION AND FLOOR PLANS. CAPACITY, 28 PATIENTS. COST, $9,000.

of a private room 8 feet by 8 feet and a nurses' bedroom 14 feet long by 8 feet wide, placed next to the main building. The capacity of the building is thirty-three patients at an estimated cost of $15,000.

The Cuenca Sanatorium, Bass Lake, Minn. (Illustration 41). This is a frame building on a stone foundation, with two stories and a cellar, and two wings or porches extending out from the first floor. The building is 34 feet wide by 60 feet deep and the wings are each 65 feet long by 13 feet deep.

On the first floor is a dining and living room 35 feet wide by 24 feet deep, a kitchen 20 feet wide by 24 feet deep, a small pantry, hall, sleeping room for the cook, and storeroom. On the second floor are four private rooms 10 feet wide by 14 feet long, a small corridor four feet wide, closets, toilets, baths, and two wards, one 10 feet wide by 20 feet long, with three beds for women, and the other 16 feet wide by 23 feet long, with five beds for men. The basement contains the laundry, and a boiler room, where a gasolene pumping engine is installed to supply two large water tanks.

The wings or sleeping porches are eight feet in the clear to the ceiling and separated from the central portion of the building by a room containing the toilets, baths and lockers for the patients. Their fronts are open, but protected in stormy weather by canvas curtains, and cross-ventilation is obtained through windows in the rear walls. The dressing rooms in this building are inadequate for ten patients and would be better if located behind the porches and so arranged that the patient would not have to walk so far to reach them. The porches should be wider and divided by one or more partitions in order to house the patients in smaller groups.



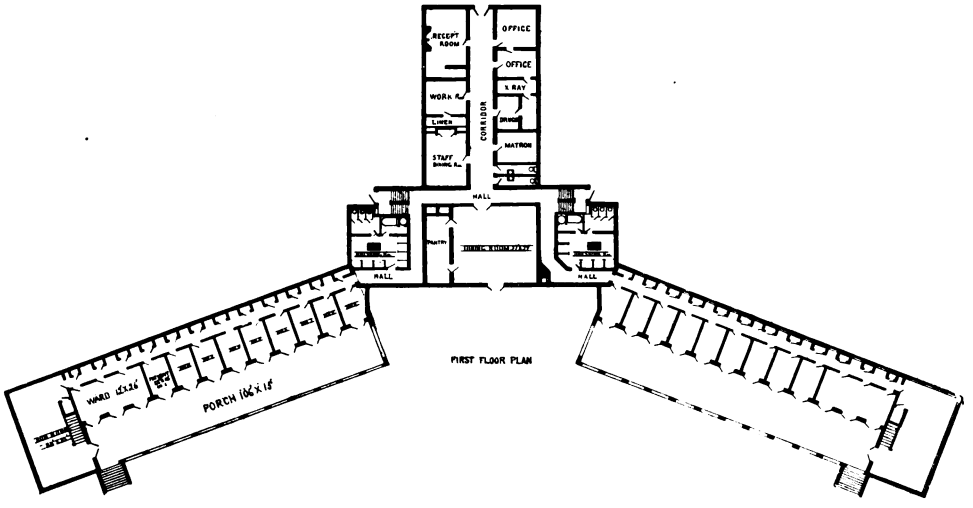
No. 42.—Association Sanatorium, Colorado Springs, Colo. N. VAN DEN AREND, ARCHITECT. ELEVATION AND FLOOR PLANS. CAPACITY, 24 PATIENTS. ESTIMATED COST, $25,000.

The building has a capacity for twenty-eight patients, and cost, including water supply, plumbing and sewage disposal, $9,000. It is one of the first of a new type of a complete plant under one roof for small institutions housing tuberculous patients, and the following buildings illustrated in this section are of the same type, but with some improvements.

Colorado Springs Association Sanatorium, Colorado Springs, Colo. (Illustration 42). These plans were designed for a small temporary reception hospital to house all classes of patients under one roof. The building is to be frame construction on a stone foundation, covered externally with shingles, and should make an artistic and attractive structure. The building consists of a central section 25 feet wide by 80 feet deep, having a basement and two stories, with wings or porches extending from the sides 86 feet long by 24 feet wide.

The basement contains rooms for the heating plant, storage of coal and supplies. The first floor consists of a sitting room 25 feet wide by 30 feet deep, a dining room 25 feet wide by 16 feet deep, a kitchen 16 feet wide by 22 feet deep, a pantry 8 feet wide by 12 feet deep, store-rooms, and an office 11 feet wide by 12 feet deep. The second floor is one apartment of four rooms, all 14 feet wide by 14 feet deep, and toilets, baths and closets for the use of the nursing staff.

The plans of this building have the same general arrangement as the Cuenca Sanatorium, with the exception that all the patients are to have separate dressing rooms at the back of the porches; this will make the wings more commodious and is an improve-



No. 43.—District Tuberculosis Hospital, Lima, Ohio. McLaughlin and Hulskin, Architects. View of Front and Rear Elevations and Floor Plans. Present Capacity, 28 Patients. Wings to be Extended as Shown in Floor Plans with a Capacity for 100 Patients. (For plan of basement see illustration No. 20.) Estimated Cost, $100,000.

ment. The bathrooms and toilets are situated next to the main building, but would be made more convenient if placed in the rear of the wings. The capacity will be for twenty-four patients at an estimated cost of $25,000.

District Tuberculosis Hospital, Lima, Ohio (Illustration 43). This building is situated on a site of fifty-five acres in a well wooded grove two and one-half miles from Lima, Ohio, on the Western and Interurban Electric Road. It is constructed of brick, on stone foundations, with brick porches facing the south at the rear, and is divided into three sections: the centre for administration purposes, and two wings for the patients' quarters.

The front of the administrative section faces the north, and its basement contains the servants' dining room 14 feet wide by 24 feet long, the kitchen 22 feet wide by 24 feet long, bakery 14 feet wide by 20 feet long, pantry, vegetable and grocery store rooms, laundry, heating and power plant, cold storage rooms, toilets and trunk room and a mortuary. (See Illustration No. 20.)

The first floor contains a general dining room for patients, 27 feet wide by 29 feet long, a pantry, and dish sterilizing room 24 feet long by 8 feet wide, two dressing rooms 20 feet wide by 21 feet long, with lockers, bath and toilets, staff dining room 18 feet long by 14 feet wide, store-room 12 feet wide by 14 feet long, reception room 14 feet wide by 19 feet long, general office 10 feet wide by 14 feet long, private office 11 feet wide by 14 feet long, *x*-ray room 5 feet wide by 14 feet long, drug room 12 feet long by 7 feet wide, library 12 feet long by 6 feet wide and matron's room 11 feet wide by 14 feet long.

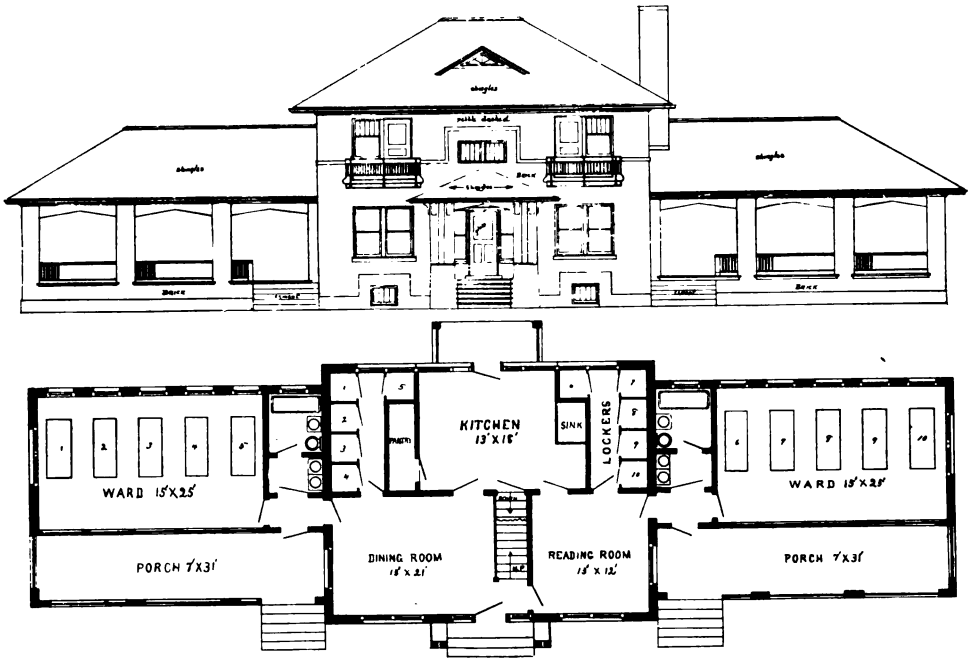
The second floor contains sixteen rooms all about 10 feet wide by 13 feet deep, and baths and toilet for the staff, nurses and servants; also two large dressing rooms with lockers and toilets arranged in the same manner as on the floor below, for the patients in the pavilions.

The two sections of the building used as patients' quarters are divided into single rooms 8 feet wide by 12 feet deep, which face the south and open in front on to a porch fifteen feet wide and in the rear on a corridor leading to the dressing, toilet and dining rooms. One of the institution's most interesting details is the arrangement of the patients' lockers or closets 3 feet wide by 2 feet deep between the windows in the corridor at the rear of the rooms.

The building was planned to have a capacity of one hundred patients housed in separate rooms in the pavilions extending from the administration section and ending at the far end in a sun parlor or sitting room 20 feet wide by 35 feet long, but as the funds to complete the original plans as illustrated were not appropriated these pavilions are unfinished. At present there are only rooms for twenty-eight beds, the ends of the wings with a number of rooms and the sitting rooms not having been built, but they will be completed as more room is needed.

The present building cost $80,000. This includes a water tower one hundred and twenty-six feet high filled from an artificial lake constructed for the hospital, the power plant in the basement, plumbing and administration facilities for one hundred patients.

Plan for a Small Village or Town Sanatorium (Illustration 44). This is a design for a small tuberculosis hospital or sanatorium to house an entire plant under one roof. It has a capacity for fourteen patients, but the dormitory wings can be built two stories high and the number increased to twenty-four. It is an interesting and compact design for a small village or town institution housing incipient cases, and the floor



No. 44.—A Design for a Small Village or Town Hospital or Sanatorium. FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 14 PATIENTS. ESTIMATED COST, $15,000.

plans can be adapted for advanced cases without greatly adding to the expense of construction, by increasing the length of the dormitory wings eight feet, and placing partitions between the beds. The first floor should be built of brick or reinforced concrete on a stone foundation with a basement under the entire structure; the second floor walls of stucco on metal lath finished in colors or with dashed pebbles, and the roof of stained shingles. The building will be one hundred feet along the front by twenty-four feet deep through the wings. The dormitories 14 feet wide by 25 feet long, and the porches 7 feet wide by 32 feet long. The front walls dividing the dormitories from the porches are constructed of pillars with windows between, which can be pushed up out of the way, leaving the space entirely clear. There are also windows in the rear and side walls giving good cross-ventilation. At the end of the dormitories next to the central section of the building are bathrooms, toilet and lockers for the patients. The lockers are 3 feet wide by 3 feet deep in order to give a small private space to each person.

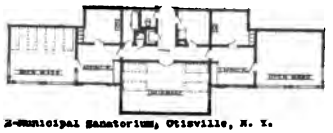
The central section of the first floor is divided into a reading room 12 feet long by 12 feet wide, a dining room 17 feet long by 12 feet wide, a kitchen 13 feet long by 14 feet wide and a pantry. The second floor contains two small wards for two patients each and a nurses' apartment divided into a sitting room, bedroom and bath.

The entire building is to be heated by a steam plant in the cellar and should be situated so it can be connected with the city sewers and lighting service. The estimated cost is $15,000.

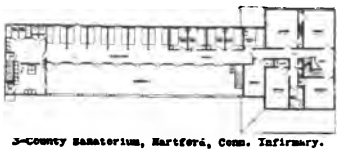
SECTION IV

Hospitals for Advanced Cases, Infirmaries and Reception Hospitals

1-Maryland State Sanatorium. Infirmary.

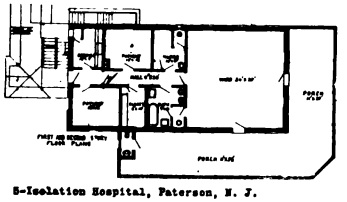


2-Municipal Sanatorium, Otisville, N. Y.



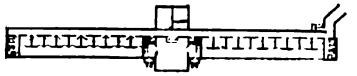
3-County Sanatorium, Hartford, Conn. Infirmary.

4-Design for Hospital (Advanced Cases)

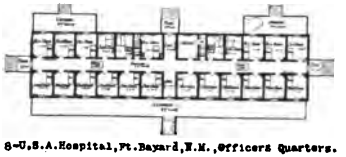


5-Isolation Hospital, Paterson, N. J.

6-Georga State Sanatorium, Infirmary

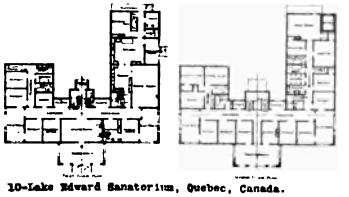


7-Indiana State Sanatorium, Rockville, Ind.

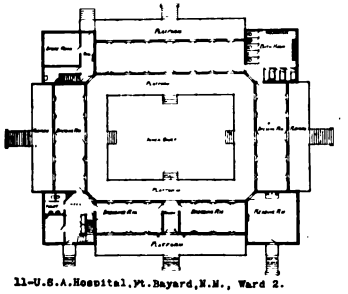


8-U.S.A.Hospital, Ft.Bayard, N.M., Officers Quarters.

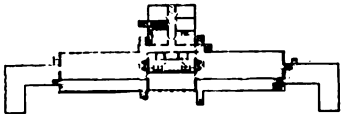
9-Riverside Hospital, New York City.



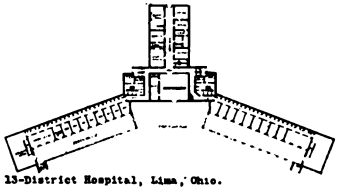
10-Lake Edward Sanatorium, Quebec, Canada.



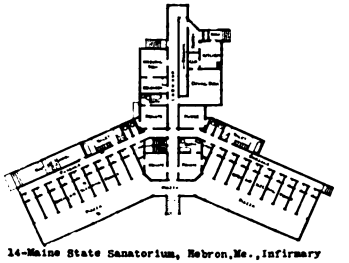
11-U.S.A.Hospital, Ft.Bayard, N.M., Ward 2.



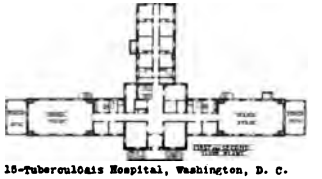
12-Massachusetts State Sanatorium, Lakeville, Mass.



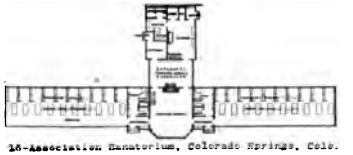
13-District Hospital, Lima, Ohio.



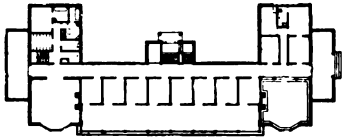
14-Maine State Sanatorium, Hebron, Me., Infirmary



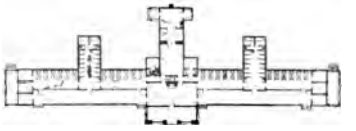
15-Tuberculosis Hospital, Washington, D. C.



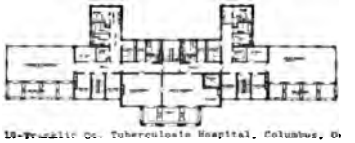
16-Association Sanatorium, Colorado Springs, Colo.



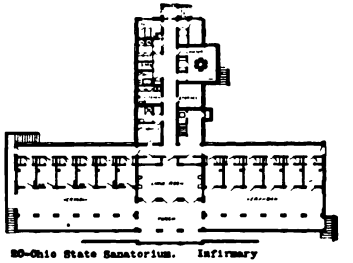
17-Jewish Hospital, Reisterstown, Md.



18-Rudowood Sanatorium, Md., Infirmary.



19-Franklin Co. Tuberculosis Hospital, Columbus, O.



20-Ohio State Sanatorium. Infirmary

21-Boston Consumptives' Hospital, Mattapan, Mass.

No. 45.—Comparison of the Floor Plans of Infirmaries, Reception Hospitals, and Buildings Housing Advanced Cases. THIS PLATE IS INTENDED TO SHOW THE VARIATION IN THE ARRANGEMENT OF THE BUILDINGS, BUT DOES NOT GIVE INFORMATION IN REGARD TO THE DIMENSIONS. WHICH WILL BE FOUND IN THE TEXT DESCRIBING THE INSTITUTIONS.

SECTION IV

Hospitals for Advanced Cases, Infirmaries and Reception Hospitals

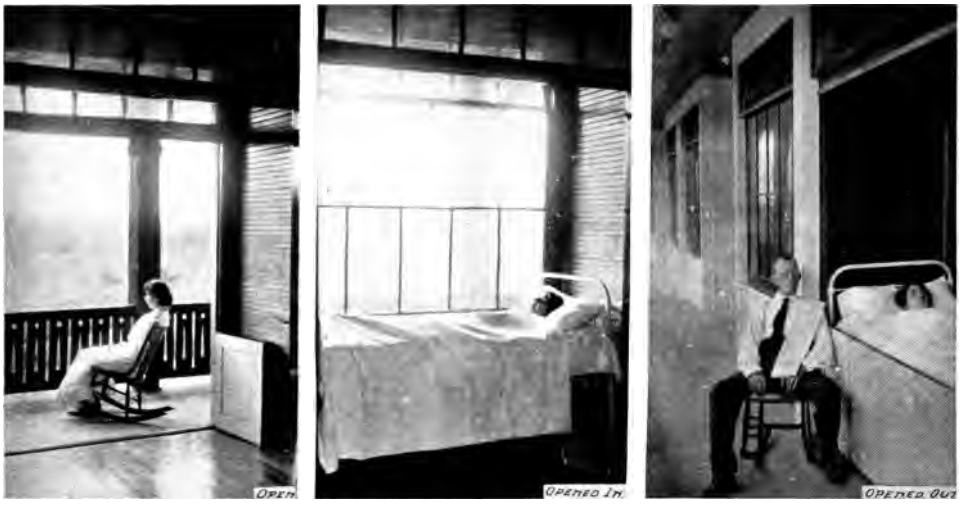
The three types of buildings grouped together in this section for description, are all intended for patients who need comfort, good nursing, and the housing supplied by a general hospital. They are used for the same general purposes, that is, for the care of cases too sick to look after themselves, and at many institutions one building serves the purpose for which all are constructed and therefore it is hardly possible to separate them for purposes of description.

Hospitals for Advanced Cases

These buildings are intended, as their name indicates, to house and care for patients who are unable, because of the advanced condition of their disease, to live in lean-tos or open cottages. They are usually built on the lines of a general hospital, either the entire plant under one roof (as described in Section III) or on the pavilion plan. Also sometimes as a separate pavilion in connection with a general hospital or sanatorium in the open country.

An advanced case hospital does not mean a home for incurables, for there can be no hard and fast line of demarcation drawn between curable and incurable cases. It has been found that many patients sent to institutions where they may be isolated until their death, improve under good hygienic surroundings and recover for all practical purposes. It is the opinion of many authorities that the advanced case does better on a porch in the open air than in an enclosed room and can stand with benefit a comparatively large amount of cold and exposure. It is therefore necessary that buildings for this purpose, besides being heated, and supplied with the comforts and conveniences of a general hospital, must also have large verandas connected with the wards and rooms by windows, cut down to the floor, and doors through which beds can be rolled, in order to provide the same facilities for the open air treatment necessary for incipient cases. Such porches should be used in pleasant weather by patients, even when far advanced in the disease, as there is hope for all, when they are not in a dying condition.

Where very ill patients are to be cared for, it will give them comfort and save much labor if the rooms and porches are connected by some arrangement such as the Indiana Convertible Sleeper, installed at the Indiana State Hospital (Illustration 46), which consists of a space three feet six inches wide across the entire front between the porch and room, enclosed on the outside by a glass and sash window that can be raised or lowered, and on the inside by glass doors that can be opened or shut. In this clear space between the doors and windows is placed the bed, three feet wide, which is cut off from the room when the doors are closed, and cut off from the porch when the window is lowered. If doors and windows are both open, the front of the room is entirely clear to the porch. It is claimed for this arrangement that patients can be exposed to the air on the porch,



No. 46.—Indiana State Hospital, Rockville, Ind. BRUBAKER & STERN, ARCHITECTS. "CONVERTIBLE SLEEPER," SHOWING ARRANGEMENT FOR CONNECTING ROOMS WITH OPEN PORCHES, IN ORDER TO EXPOSE THE PATIENTS TO THE OUTER AIR OR PLACE THEM IN HEATED ROOMS WITHOUT MOVING THE BEDS. (See illustrations 7, 26 and 51 for further description of this institution.)

cr removed from it and placed in the heated rooms, without disturbing them or moving the bed.

An essential point to be considered in planning buildings for advanced cases is, that tuberculous patients in the last stages of the disease are very annoying to each other, and should therefore be housed in separate rooms instead of wards. They are easily affected by disturbances, and any excitement, such as grief, anger or worry, is usually followed by a fit of coughing and depression. Coughing is not only bad for the individual, but when patients are housed in wards, it may disturb ten or fifteen others, and is also a strong suggestion which often causes an epidemic of coughing among them. The mistake and cruelty of placing in one room a number of persons suffering from a serious chronic disease is only just beginning to be appreciated; and there is no doubt that many patients who fail to make satisfactory progress against disease when housed in wards, rapidly improve when removed to the quiet and privacy of a separate room. The single room pavilions are slightly more expensive to construct than the ward buildings, but they have advantages and it is easier to manage patients housed in them. The psychological tendency of a private room is to make patients more contented, and also to increase their self-respect.

Advanced case hospitals are built not only in order to care for the patient, but also to prevent the spread of pulmonary tuberculosis, which is due in a great measure to the cases of consumption which remain and die in their homes infecting other members of their families. If all advanced cases could be cared for in hospitals, the disease would more rapidly disappear. Public opinion at present will not allow the passage of laws compelling persons in the advanced stages of this disease to enter institutions for their segregation; therefore, hospitals should be made comfortable and home-like in order to attract the patients and hold them.

There are now in use for advanced cases at open air sanatoria pavilions constructed on the lean-to plan with the porches divided into single rooms and finished with plaster on the interior. They are closed in front with glass and sash windows and make very satis-

factory quarters when heated. It is a simple method of housing, has the advantage of providing plenty of porch space and is economical. A lean-to for sixteen patients finished for advanced cases, can be built for from $5,000 to $10,000, and when near an administration building, administered as easily as a more costly structure.

Infirmaries

In large cities where a hospital for the care of advanced cases has a working connection with an open air sanatorium in the country for the cure of incipient consumption, it has been found that there is more or less interchange of cases between the two institutions. Patients taken into the hospital for advanced cases, to be cared for until they die, often improve under nursing, good food and hygienic surroundings, and are then sent to the country, while others who go to the sanatorium for the cure seemingly only incipient cases, gradually fail in strength or develop acute symptoms and have to be sent to the city hospital and remain there until they die.

This peculiarity of the disease has created a need for buildings on sanatorium grounds, where patients who have come to be cured, but develop symptoms of advanced disease, can be housed and cared for until they improve or are discharged. There is also a need in all large sanatoria for a building where patients taking the open air treatment can be placed if they develop some other acute disease which requires nursing. Buildings used for these purposes are called infirmaries, and combine the structural details of both the general hospital and the large open air buildings of the sanatorium. They are often constructed as a complete unit and administered separately from the other sanatorium buildings. Many of them have a dining room, kitchen and quarters for nurses and servants, who do not have any relationship except an official one, with other parts of the institution. In some instances the infirmary building houses the medical department and may be designated the medical building, as illustrated in this section, by the Adirondack Cottage and Edward Sanatorium infirmaries.

These buildings should be heated and constructed of good material, fire-proof if possible, and with all the sanitary precautions taken to make a general hospital comfortable and convenient, and the material used in them from becoming infected.

No. 47.—Isolation Hospital, Paterson, N. J. CHARLES E. WHITE, ARCHITECT. VIEW OF THE CORNER OF ONE OF THE PORCHES SHOWING METHOD OF HEATING FOR ADVANCED CASES BY STEAM PIPES. (See illustration 52 for further description of this institution.)

Reception Hospitals

A reception hospital is intended to provide a place for the temporary care of cases arriving at institutions for the treatment of pulmonary tuberculosis and where these new patients may be under observation in order that the physicians can classify the stage of their disease and learn the idiosyncrasies of each case under fresh air

treatment before placing them in open shacks and cottages. Reception hospitals are also used for the same purposes as infirmaries and should be constructed in the same manner and with as good material as is used for advanced case buildings.

EXAMPLES OF HOSPITALS FOR ADVANCED CASES

Riverside Hospital, New York City, The Concrete Pavilion (Illustration 48). This building is constructed of reinforced concrete, 111 feet long by 18 feet wide through the wards, and was designed on the lines of a lean-to four stories high; a sitting room between two open-air pavilions with dressing, toilet and bath rooms in a rear extension. It is used for advanced cases and arranged so that the front can be thrown entirely open, converting the wards on each story into open-air porches. This building was designed to be used interchangeably for the care of cases of tuberculosis and the contagious diseases (measles, scarlet fever, etc.), according to the needs of the service.

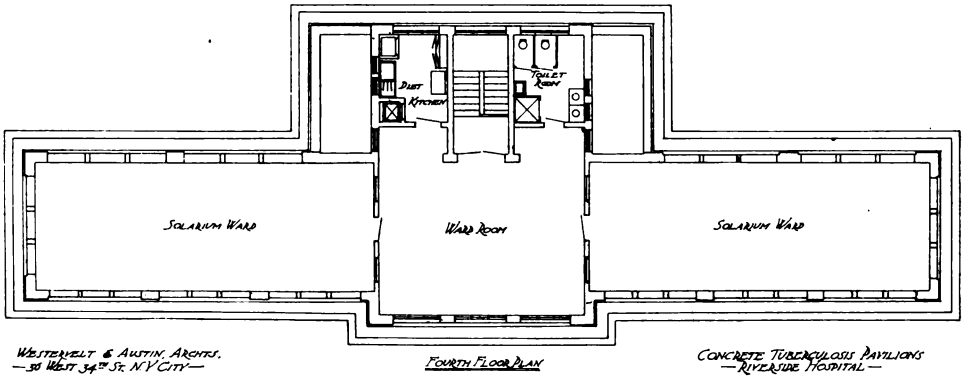
The wings on the first floor are 36 feet long by 16 feet wide, with an apartment between them 29 feet long by 15 feet wide used as a dining room. The wards on the second and third floors are 41 feet long by 16 feet deep, with a sitting room 18 feet wide by 21 feet deep in the centre. The fourth story or roof garden is divided into two open wards and one open-air sitting room of the same dimensions as those below.

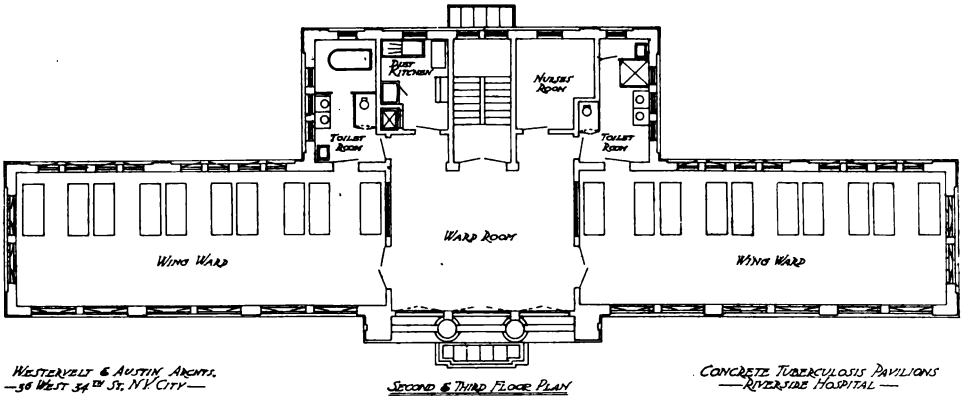
The Riverside Hospital for advanced tuberculous patients is on North Brother Island at the upper end of the East River near Long Island Sound. The institution is in an isolated position. The air is pure and so far as climatic conditions are concerned is an ideal site for a sheltered open air building. The authorities feel that the advanced patients sent there should be housed in a manner that will give them every chance of a cure, and these concrete pavilions are being built as an experiment with the hope that some of the cases will respond to the treatment and that all the patients housed in these structures will do better than they did in the old block type of hospital.

This building has a capacity of seventy-eight patients and the estimated cost is $40,000.

Jewish Hospital for Consumptives, Reisterstown, Md., ADVANCED CASE PAVILION (Illustrations 49 and 50). The building is 153 feet long including the side porches, and 57 feet deep through the wings; located on the southern slope of a hill, with a basement above ground on the south side. The material used for the foundations and walls of the basement is native stone, for the first story pressed brick, and the second story rough stucco on metal lath. The interior walls and ceilings are of hard plaster with round corners, covered with non-absorbent washable paint, and finished in plain wood surfaces; the floors are of hard wood dressed with oil.

The basement contains the dining room 51 feet wide by 30 feet deep, kitchen 23 feet wide by 28 feet deep, serving room, pantry, fuel storage, laundry, sterilizing and drying rooms. There are sixteen single rooms in the building 10 feet wide by 12 feet deep and 10 feet high, and two wards of four beds, each patient being allotted twelve hundred cubic feet of air space. The sleeping porches in the centre of the building are 83 feet long by 12 feet wide, protected at each end by the extension of the building, twelve feet to the south. The reception room, 21 feet wide by 23 feet long, and the superintendent's quarters, which





No. 48.—Riverside Hospital, New York City. Designed by Dr. Hermann M. Biggs. Westervelt & Austin, Architects. Concrete Pavilion for Advanced Cases. Front Elevation and Floor Plans. Capacity, 78 Patients. Estimated Cost, $40,000.

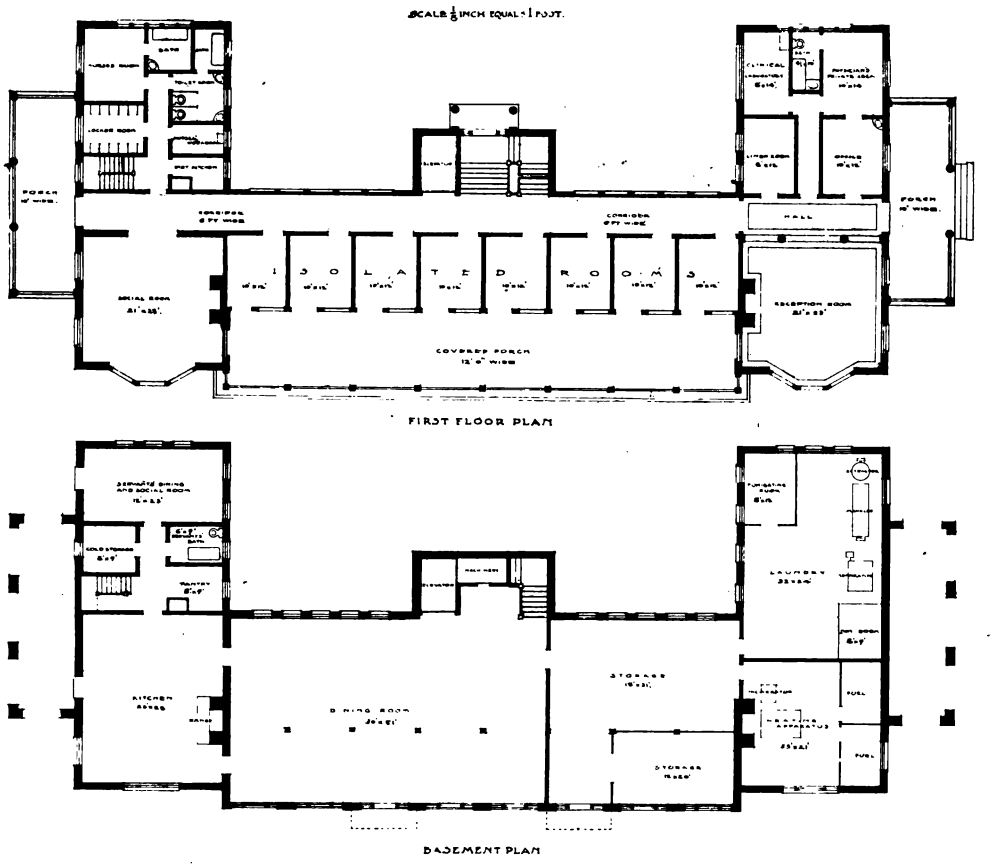
consist of office, sleeping room, bath and toilet, are on the first floor in the east wing. The main entrance is on the first floor in the centre of the building, and leads by a stairway to all the floors.

The rear extensions at the ends of the building are 28 feet deep from the wall of the corridor and 25 feet wide, and contain the nurses' rooms, toilets and baths, service stairways, lockers, diet kitchens, patients' toilets and baths, drug and supply rooms. The centres of both the upper floors are used for housing the patients. Their sitting rooms, porches and sleeping apartments face the south and are protected from the north winds by a heated corridor extending the entire length of the building.

All the rooms are heated by direct steam radiators, lighted by electricity, provided with electric bed warmers, have electric connections with the nurses' apartments and are screened against insects. The doors open on to a porch in front and into a corridor at the rear six feet wide, and over them are movable transoms giving cross-ventilation above the beds. The doorways are wide and have no sills, so that the beds can be rolled through either end and moved from one floor to another on the elevator.

The building was erected for advanced cases with the idea of obtaining unobstructed cross-ventilation from every direction without mechanical means, and of giving most of the patients an individual room with porch space equal to its floor area. The building has a capacity of twenty-four beds and cost $30,000.

No. 49.—Jewish Hospital for Consumptives, Reisterstown, Md. PAVILION FOR ADVANCED CASES. VIEW OF FRONT AND REAR ELEVATIONS. CAPACITY, 24 PATIENTS. COST, $30,000.

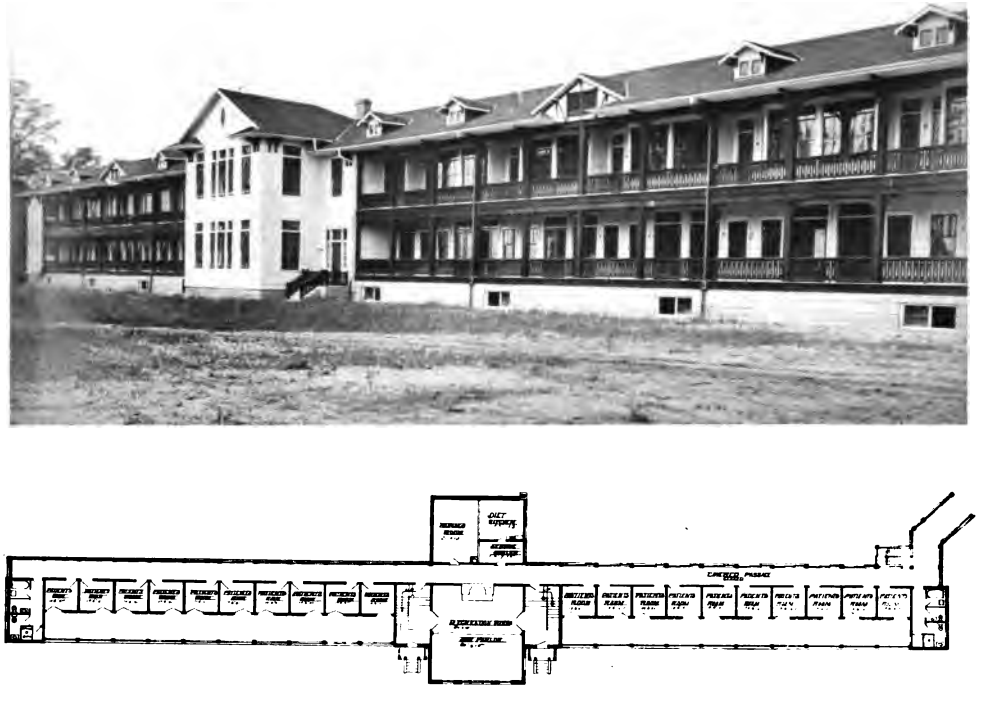


No. 50.—Jewish Hospital for Consumptives, Reisterstown, Md. PAVILION FOR ADVANCED CASES. FLOOR PLANS. CAPACITY, 24 PATIENTS. COST, $30,000.

Indiana State Hospital, Rockville, Ind., WARD BUILDING (Illustration 51). This is one of two similar buildings connected with the administration building illustrated in Section II. It is 295 feet long, 59 feet deep through the centre and 25 feet deep through the wings, two stories without a basement, and of frame construction on a concrete foundation. On each side of the central section the w'ngs are divided into a row of single rooms 10 feet wide by 10 feet deep, with a sleeping porch 10 feet wide and 100 feet long in the front, and a corridor five feet wide in the rear. In the centre is a sun parlor 30 feet wide by 33 feet deep, a nurses' room 14 feet wide by 20 feet deep, a diet kitchen 13 feet wide by 13 feet deep and a serving room. At the outer ends are the patients' toilets, baths and lavatories.

The corridor in the rear of the rooms on both stories is connected by an enclosed passageway with a hall in the administration building, in order that the patients may be sheltered in bad weather while going to and from their meals. Under these passageways are tunnels connecting the pavilions, administration building and power house, and carrying the service pipes, lighting wires and heating mains.

The rooms on the first floor are protected on the front by double glass doors opening out on to the sleeping porches, through which the beds can be run when desired. Those



No. 51.—Indiana State Hospital, Rockville, Ind. WARD BUILDING. BRUBAKER & STERN, ARCHITECTS. VIEW OF FRONT ELEVATION AND FLOOR PLAN; BOTH FLOORS ALIKE. CAPACITY, 40 PATIENTS. ESTIMATED COST, $30,000. (See illustrations 7, 26 and 46 for further description of this institution.)

on the second floor are equipped with an arrangement called the "Indiana Convertible Sleeper," described on pages 91 and 92.

The building has a capacity for forty patients, all housed in single rooms, at an estimated cost of $30,000.

Isolation Hospital, Paterson, N. J., TUBERCULOSIS PAVILION (Illustration 52). This is a two story building constructed of reinforced concrete, with concrete floors, and is fire-proof throughout with the exception of the window frames and the framework of the porches. It is a pavilion to house advanced tuberculous patients in connection with the Paterson Isolation Hospital, from which it is administered.

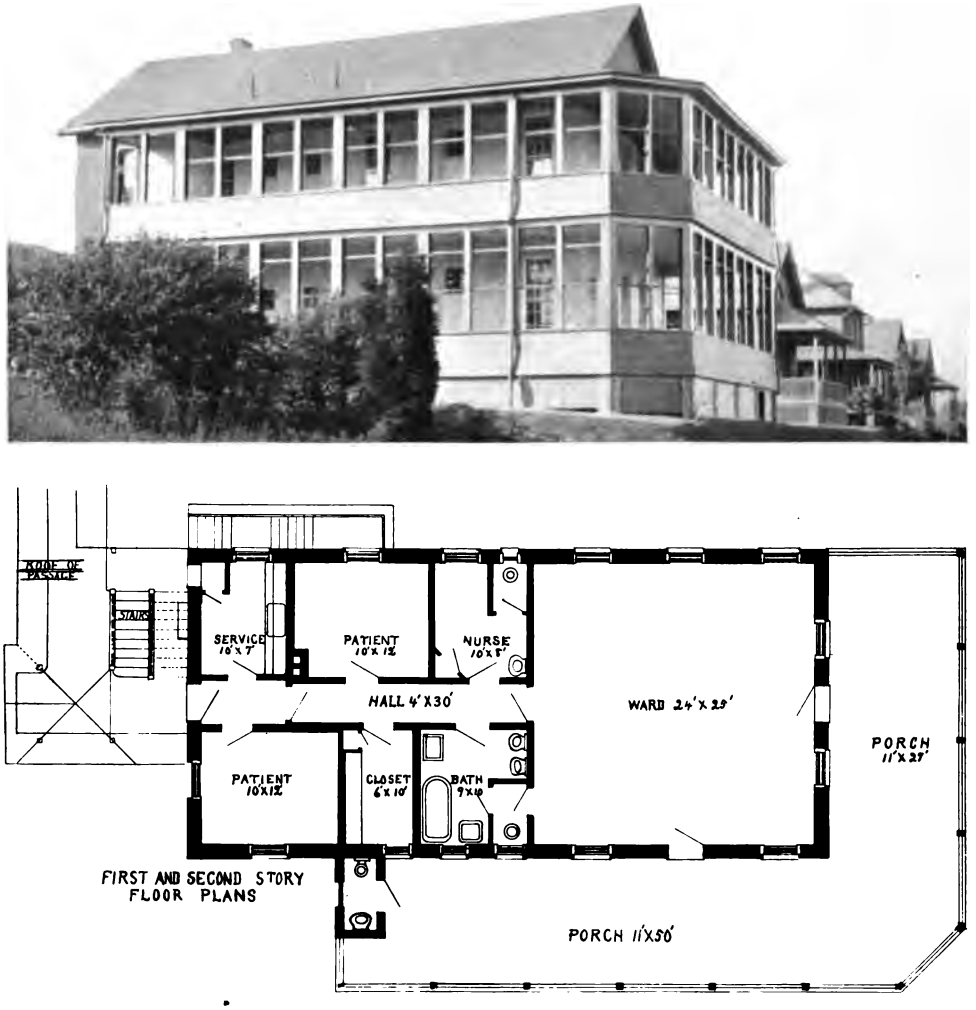
The building, not including the porch, is 56 feet deep by 27 feet wide. The floor plans of both stories are alike, divided into a ward 24 feet wide by 25 feet deep, two private rooms 10 feet wide and 12 feet long, a linen room 6 feet wide by 10 feet long, a diet kitchen 7 feet wide by 10 feet long, and a nurses' sitting room 8 feet wide by 10 feet long, containing a private toilet and stationary wash-stand, and a lavatory 10 feet by 10 feet, containing bath, wash-basins and toilet for the patients.

The porches extend on both stories along the entire front, 12 feet wide by 38 feet long, and on the south side of the building 11 feet wide by 42 feet long, floored with con-

crete, enclosed with swinging glass and sash windows and heated by steam pipes which extend along their outer edges. (See illustration No. 41.)

The pavilion has a capacity of twenty-four beds and cost $12,096, but this does not include its proportion of the expense of the power house or the enclosed corridor construction, which connects it with the administration building.

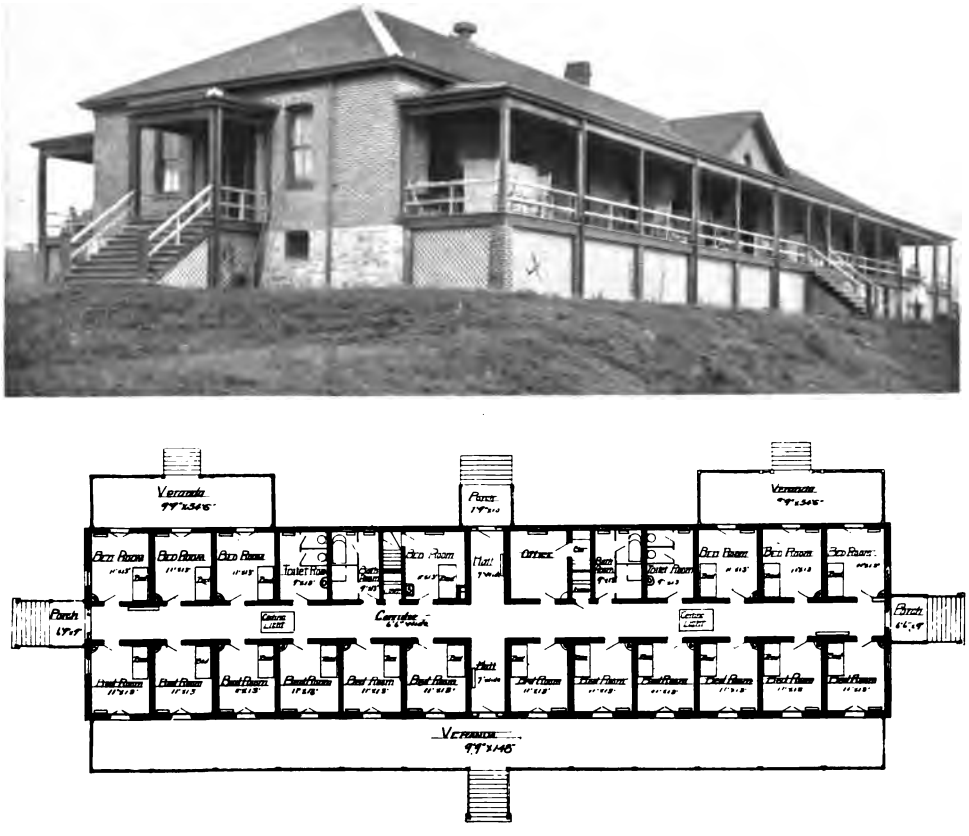
United States Army General Hospital, Fort Bayard, N. M., OFFICERS' DORMITORY (Illustration 53). This is a single story building with a stone foundation and walls of frame with brick veneer externally. The roof is shingled and the interior walls



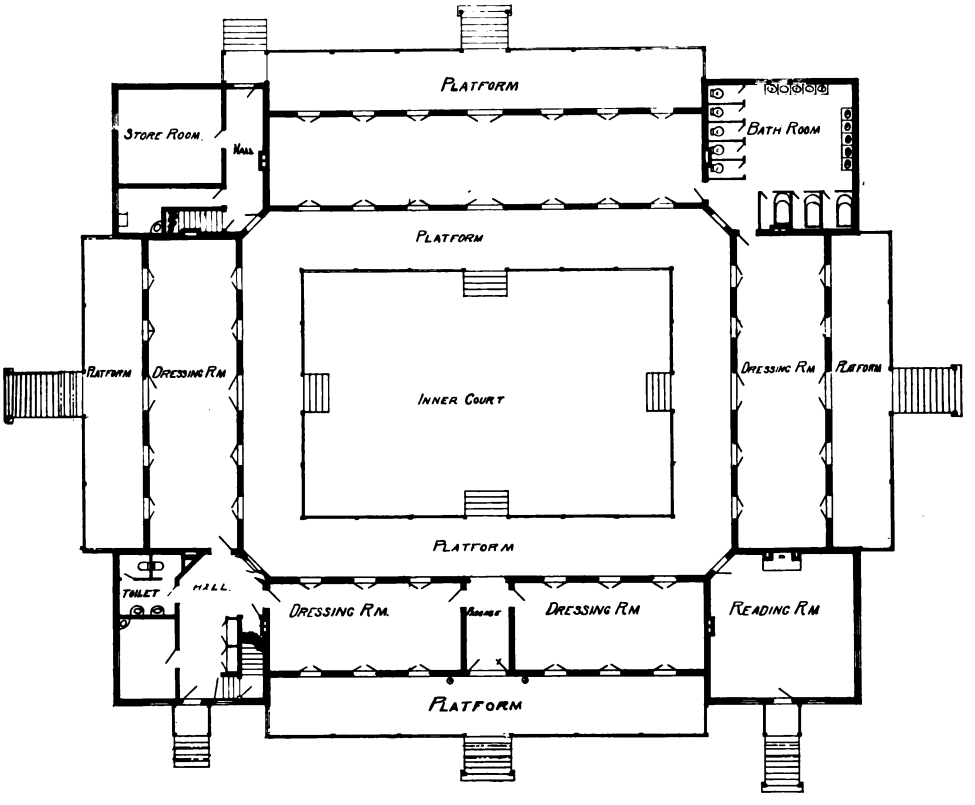
No. 52.—Isolation Hospital, Paterson, N. J. CHARLES E. WHITE, ARCHITECT. PAVILION FOR ADVANCED CASES. VIEW OF FRONT AND SIDE ELEVATION. FLOOR PLAN; BOTH FLOORS ARE ALIKE. CAPACITY, 24 PATIENTS. COST, $12,096. (See illustration 47 for further description of this institution.)

plastered. The building is 147 feet long by 34 feet wide, heated by a hot water system and lighted by electricity. It is divided down the centre by a corridor six feet six inches wide, and has eighteen rooms for patients, twelve on the south side and six on the north side, all of the same dimensions, 11 feet wide by 13 feet deep. These rooms open upon covered sleeping porches about ten feet wide, with doorways made wide enough so that the beds can be rolled through them. There is also an office 11 feet wide by 13 feet long, an attendants' room, baths and toilets. The capacity is eighteen patients and the building cost $18,534.

United States Army General Hospital, Fort Bayard, N. M., ENLISTED MEN'S WARD No. 2 (Illustrations 54 and 55). Ward Two is a single story structure, constructed of concrete with "pebble-dash" finish and built around a central court or "patio" 59 feet wide by 79 feet long. The building including the court covers ground space 100 feet wide by 130 feet long. Platforms or porches ten feet wide extend around the interior of the building on the sides of the court where the beds of the patients are placed and protected from rain and sun by canvas curtains on rollers. At the corners of the building are rooms 23 feet



No. 53.—United States Army General Hospital, Fort Bayard, N. M. OFFICERS' QUARTERS. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 18 PATIENTS. COST, $18,534.



No. 54.—United States Army General Hospital, Fort Bayard, N. M. Designed by Major George E. Bushnell. Enlisted Men's Ward No. 2. View of Front and Side Elevation and Floor Plan. Capacity, 32 Patients. Estimated Cost, $25,000.

No. 55.—United States Army General Hospital, Fort Bayard, N. M. VIEW OF INNER COURT SHOWING SLEEPING PORCHES.

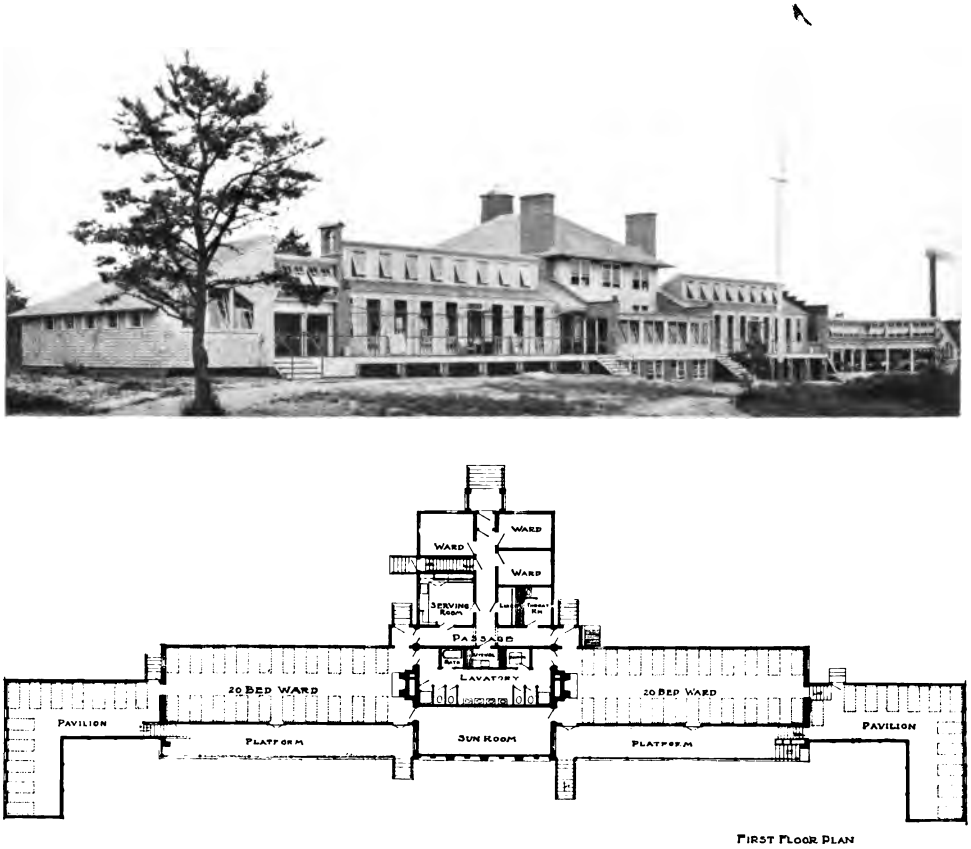
wide by 23 feet deep, used for offices, lavatories, storage and attendants. These rooms are connected by long narrow apartments 14 feet wide by 68 feet long, on two sides of the building, and 14 feet wide by 50 feet long on the others, intended as dressing rooms rather than sleeping rooms, but used for the latter purpose in stormy weather. Numerous French windows open from the dressing rooms on to the porches facing the court and also upon porches constructed on the outside of the building. This arrangement permits the beds and reclining chairs to be moved freely on to a platform having any exposure desired and gives the patients an opportunity to seek or avoid the sun at pleasure. It is reported to be very satisfactory and that two other buildings of the same design will be constructed. This type of building is especially good for dry, tropical countries, but can be used for patients' quarters in any climate if the porches are protected by permanent roofs. It has a capacity for forty patients and the estimated cost is $15,000.

Lakeville Tuberculosis Hospital, Middleboro, Mass., THE ADVANCED CASE PAVILION (Illustration 56). This structure is one of a group of buildings put up as a State Hospital for housing all classes of cases. It is two hundred and forty-eight feet long, of frame construction, placed on a stone foundation, and stone piers. It consists of a central section 36 feet wide by 62 feet deep (including the rear extension), two twenty-bed wards 64 feet long by 20 feet wide, and two twelve-bed open air pavilions built in the form of a right angle, extending forty feet from the outer ends of the wards. The central section of the building has two stories and a cellar. On the first floor is a sun parlor, three small wards, a diet kitchen, treatment room, toilets and baths.

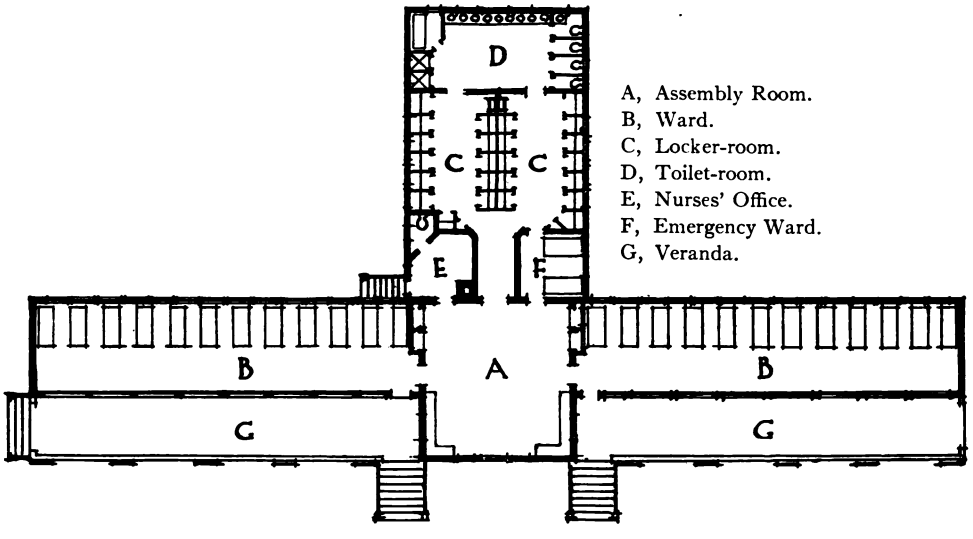
The second story is 36 feet wide by 50 feet deep and is divided into nine rooms. The cellar is of about the same size and is used for lockers, toilet rooms and storage purposes. The large wards are an objection to using the plan for this building, but they could be divided, and it is easy to administer. It would also be improved by dividing the locker rooms, bath rooms, and toilets on the main floor into two sections, providing a nurses' office, one or two more private rooms, a larger sun room, and larger wards, giving more air space to each patient.

The building has a capacity for seventy patients, and cost $17,600.

Boston Consumptives Hospital, Boston, Mass., COTTAGE FOR ADVANCED CASES (Illustration 57). This is a frame building with a shingle roof, placed on a concrete foundation and concrete piers. The interior walls are plastered and the floors are of first quality maple. The building is 144 feet long and 25 feet through the wards, including the porches, with a rear extension 45 feet deep and 28 feet wide. At the front in the centre is an assembly room 22 feet wide by 24 feet deep and in the rear extension an emergency



No. 56.—Lakeville Tuberculosis Hospital, Middleboro, Mass. JOHN A. FOX, ARCHITECT. PAVILION FOR ADVANCED CASES. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 70 BEDS. COST, $17,600.



No. 57.—Boston Consumptives Hospital, Mattapan, Mass. MAGINNIS, WALSH & SULLIVAN, ARCHITECTS. COTTAGE WARD FOR ADVANCED CASES. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 24 PATIENTS. COST, $14,000.

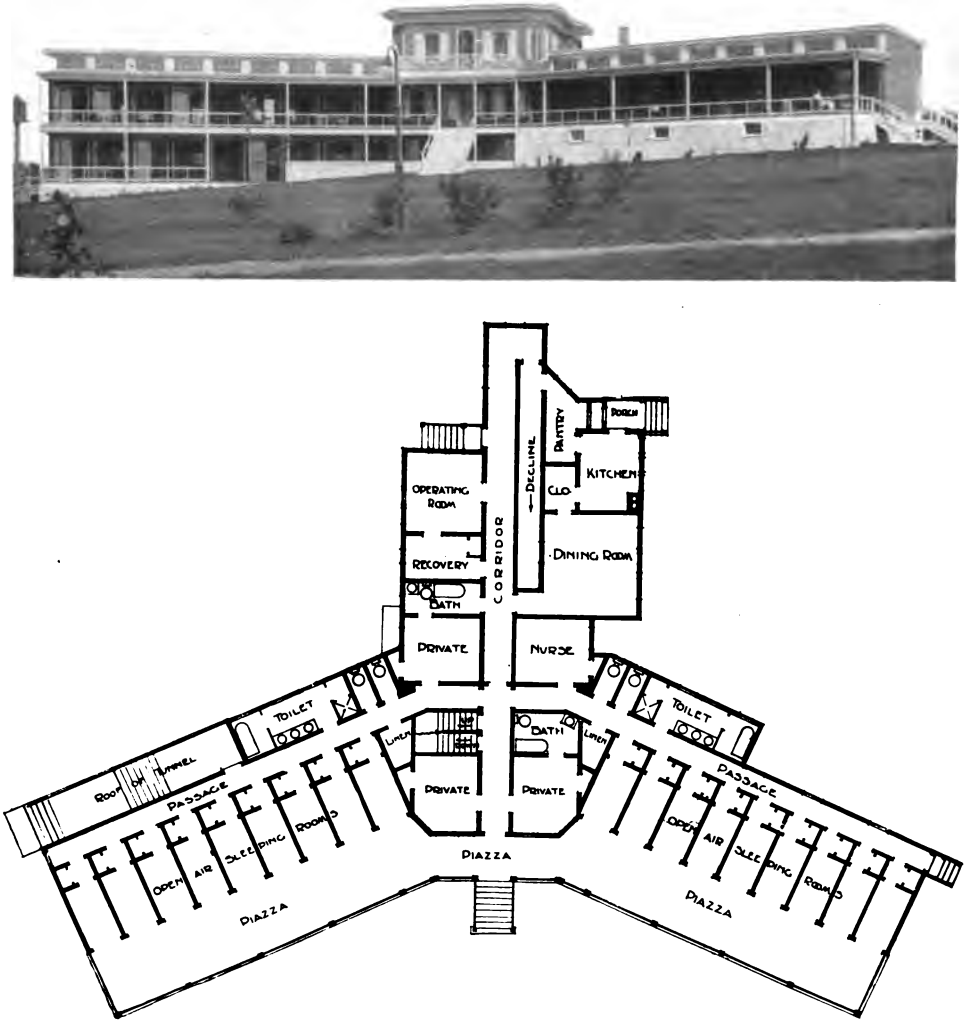
ward of two beds and a nurses' room, both 10 feet wide by 11 feet deep, two dressing rooms 14 feet wide by 21 feet deep, each containing twelve lockers 3 feet wide and 2½ feet deep, and two toilet rooms 27 feet wide by 13 feet deep, furnished with six lavatories, four toilets, two baths and two showers. The wards face the south, are 14 feet wide by 16 feet long, and each contains a single row of twelve beds, with a veranda in their front 10 feet wide by 60 feet long, separated from the wards by a glass partition made up of triple hung windows

extending from the roof to the floor. Along the north side of the wards is a row of windows which give cross-ventilation.

It has been suggested that doors be substituted for the triple hung windows on the front, as they are rather heavy and hard to move. This ward is for slightly advanced cases and is very satisfactory for the purpose. It is heated by steam, lighted by electricity, has a capacity for twenty-six patients, and cost, including equipment, $15,000.

EXAMPLES OF INFIRMARIES AND RECEPTION HOSPITALS

Maine State Sanatorium, Hebron, Me., THE INFIRMARY (Illustration 58). This is a frame structure, on a stone foundation. Under the left wing the ground falls off to

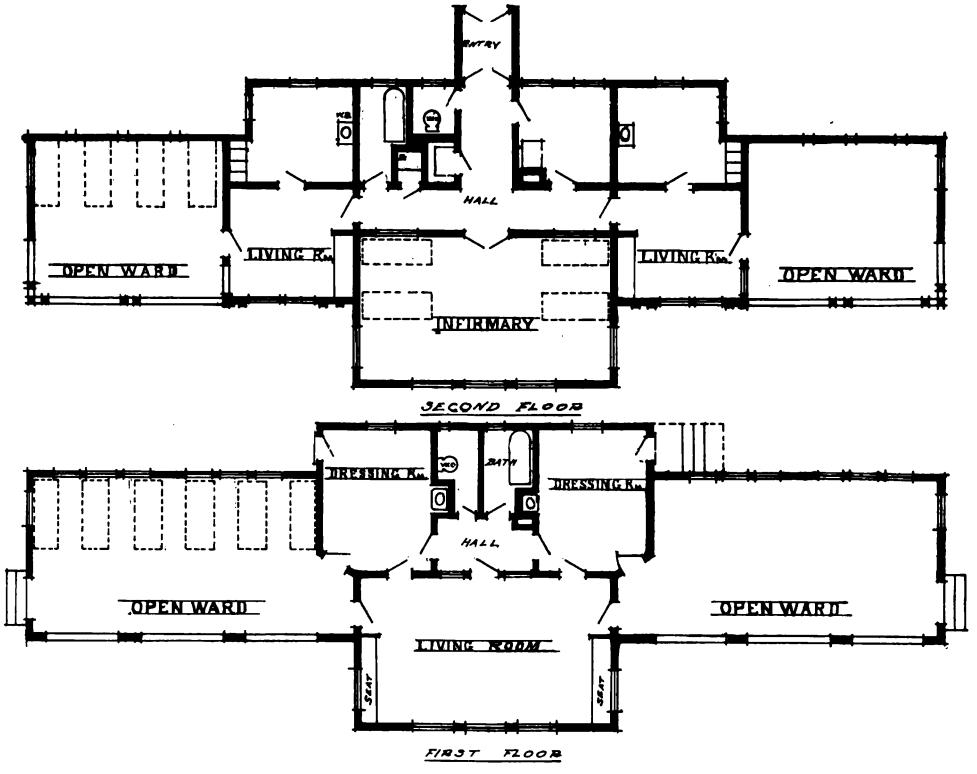


No. 58.—Maine State Sanatorium, Hebron, Me. T. C. STEVENS AND J. H. STEVENS, ARCHITECTS. INFIRMARY. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 30 PATIENTS. ESTIMATED COST, $30,000. (See illustrations 11 and 23 for further description of this institution.)

such an extent that an open ward was constructed in the basement, providing an arrangement similar to that on the floor above. The building consists of a centre section, two stories high, two wings and a rear extension. The front of the building is in the form of an acute angle and has a porch running its entire length, eleven feet wide. The wings are 32 feet wide by 61 feet long, divided into nine single rooms each 7 feet wide by 11 feet deep, with a closet 3 feet wide by 2 feet deep, and a passageway or corridor four feet wide in their rear. It should be noted that the rooms are ventilated by transoms opening above the roof of the porch through which sunlight is obtained and that the arrangement of closets in connection with the sleeping rooms is unusual. Behind the corridor in each wing is an extension 27 feet long by 7 feet deep, containing lavatories, toilet and baths.

The central section of the building, including the rear extension, is 30 feet wide

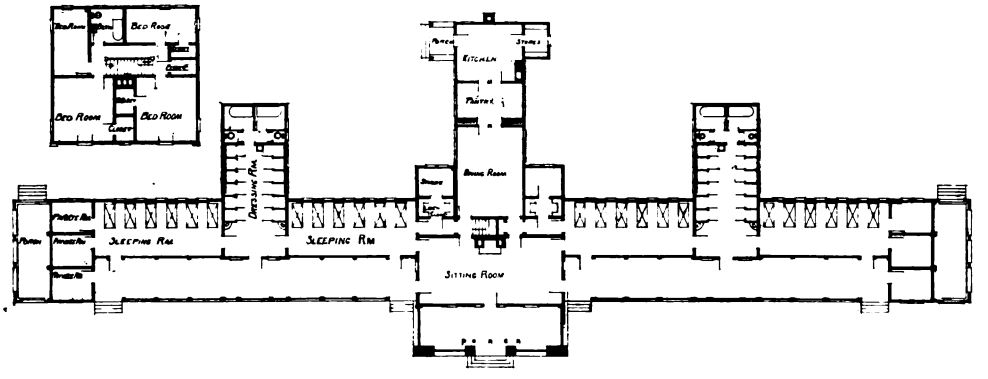
No. 59.—Municipal Sanatorium, Otisville, N. Y. Designed by Dr. Hermann M. Biggs. J. D. Burt, Architect. Women's Infirmary. Views of Front and Rear Elevations. Capacity, 24 Patients. Estimated Cost, $5,000. (See illustrations 14, 28, 85, 94 and 101 for further descriptions of this institution.)



No. 60.—Municipal Sanatorium, Otisville, N.Y. DESIGNED BY DR. HERMANN M. BIGGS. J. D. BURT, ARCHITECT. WOMEN'S INFIRMARY. FLOOR PLANS. CAPACITY, 24 PATIENTS. ESTIMATED COST, $5,000.

by 82 feet deep, divided through the centre by a hall four feet wide, which is cut at right angles by the corridor leading to the wings. On one side of the hall are two rooms, for private patients, 11 feet wide by 13 feet deep, an operating and preparation room; on the other one private room, a dining room 16 feet wide by 18 feet deep, and a kitchen 16 feet wide by 13 feet deep. The dimensions of the extension are only approximate, as the rear and sides of the building are broken and project in order to give space for the dining room and kitchen. This building is connected by a tunnel with the administration building and is heated from the central plant. The capacity is for thirty patients at an estimated cost of $20,000.

Municipal Sanatorium, Otisville, N. Y., WOMEN'S INFIRMARY (Illustrations 59 and 60). This building is a two story frame structure which rests on a stone foundation and stone piers, with a basement under the central section 25 feet wide by 29 feet deep. The exterior of the building is covered with shingles, stained green, with cream colored trimmings and the roof is also of shingles stained a Tuscan red. It is 88 feet long by 16 feet wide through the wards, and 28 feet through the centre, and consists of a centre section and two wings. The first floor is divided into two open wards for six patients each, 16 feet wide by 27 feet long, a sitting room 24 feet wide by 14 feet deep, a locker and dressing



No. 61.—Eudowood Sanatorium, Towson, Md. Archer & Allen, Architects. Infirmary Building. Views of the Front and Rear Elevations. Floor Plans. Capacity, 30 Patients. Estimated Cost, $30,000. (See illustrations 22 and 83 for further description of this institution.)

room 11 feet wide by 13 feet deep, baths, toilets and attendant's room 11 feet wide by 14 feet deep.

The second floor contains two small open wards 18 feet wide by 16 feet deep, two sitting rooms 12 feet wide by 14 feet deep, a small hall four feet wide, two dressing rooms with lockers 10 feet wide by 12 feet deep, diet kitchen, 9 feet wide by 9 feet deep, and an enclosed infirmary ward 24 feet wide by 14 feet deep, situated over the sitting room in the centre of the building with a capacity of four patients.

The building has good modern plumbing throughout and is heated through direct

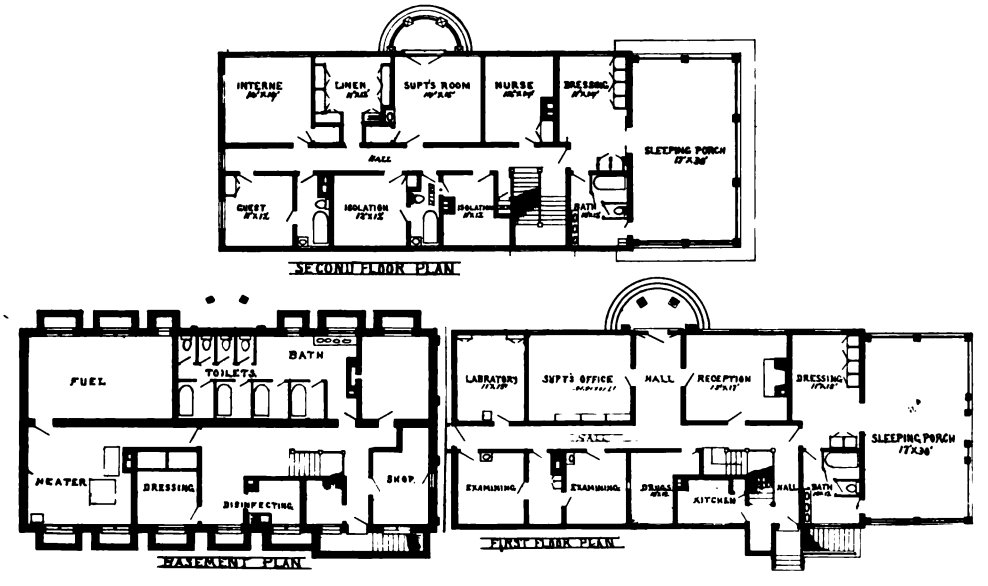
radiators by a steam heating plant in the basement which also contains a water tank for supplying hot water for toilet purposes. There is no stairway connecting the two floors, the upper story being reached by a platform running from a steep side hill in the rear of the building. The front windows are all arranged so that both sashes can slide into pockets, leaving the openings entirely free. By this means the infirmary can be changed when desirable into an open ward. The capacity is twenty-four beds, and the cost of construction was $5,000.

Eudowood Sanatorium, Towson, Md., INFIRMARY BUILDING (Illustration 61). This is a frame structure, covered externally with shingles, resting on a stone foundation and stone piers. It is 192 feet long by 25 feet wide, through the wards, and consists of a central section, two wings and three rear extensions. The centre of the building is two stories with a cellar and is designed after the Colonial style of southern architecture, 36 feet wide by 46 feet deep including the porch, but not the rear extension, which is 17 feet wide by 35 feet deep. On the front is a sitting room 35 feet wide by 16 feet deep and behind it a hall four feet wide uniting the two wings, an examining room, a linen closet and a storage room. The dining room is 15 feet wide by 21 feet deep, partly in the central section and partly in the rear extension, with a pantry 15 feet wide by 10 feet deep, and a kitchen 15 feet wide by 14 feet deep behind it. The cellar contains rooms for the heating plant and storage and the second story four bedrooms, closets, baths, toilets and a sleeping porch 11 feet wide by 34 feet long for the use of the nurses. The wings including the private rooms and porches at the ends are 98 feet long by 25 feet wide, and are divided into two wards for six patients each, 31 feet long by 13 feet deep, with a porch in their front 10 feet wide by 78 feet long, three private rooms at the outer ends each 8 feet wide by 10 feet deep, a private porch 24 feet wide by 8 feet deep, and in the rear an extension 16 feet wide by 21 feet deep, containing lockers, toilets and baths, and a dressing room.

This building is considered a model for a good infirmary at a large sanatorium, well provided with other buildings. Twenty-four patients are housed in small wards; six in private rooms, and all having private alcoves in the dressing room. The building is a complete unit, as there are comfortable quarters provided for the nurses and attendants, a dining room, kitchen, and other necessary apartments. The plans are worth careful study, and the private rooms at the ends of the wings, with a private porch which cannot be overlooked from the main buildings, should be noted. The capacity is thirty beds and the cost $30,000.

Edward Sanatorium, Naperville, Ill., INFIRMARY AND MEDICAL BUILDING (Illustration 62). This is a two story frame structure, on a stone foundation, painted white and roofed with shingles. It is 70 feet long by 34 feet wide and has a basement and an unfinished attic lighted by dormer windows. The basement contains a disinfecting room 11 feet wide by 14 feet long, a disinfecting plant for sputum cups, coal storage 24 feet long by 14 feet wide, a carpenter shop 9 feet wide by 16 feet long, a mortuary 6 feet wide by 7 feet long, a dressing room 10 feet wide by 12 feet long, with two shower baths, and an engine room 16 feet wide by 17 feet long for the heating plant, and hot water tank.

The first floor is divided down the centre by a hall and contains a reception room and superintendent's office, both 11 feet wide by 12 feet long, a dressing room 6 feet wide by 10 feet long, a drug room 10 feet wide by 11 feet long, a diet kitchen 7 feet wide by 11 feet long, and two dressing rooms for the infirmary patients, with toilets, baths and lockers.



No. 62.—Edward Sanatorium, Naperville, Ill. Designed by Dr. Theodore B. Sachs. W. A. Otis and Edward H. Clark, Architects. Infirmary and Medical Building. View of Front and Side Elevations and Floor Plans. Capacity, 12 Patients. Cost, $21,435. (See illustrations 82 and 88 for further description of this institution.)

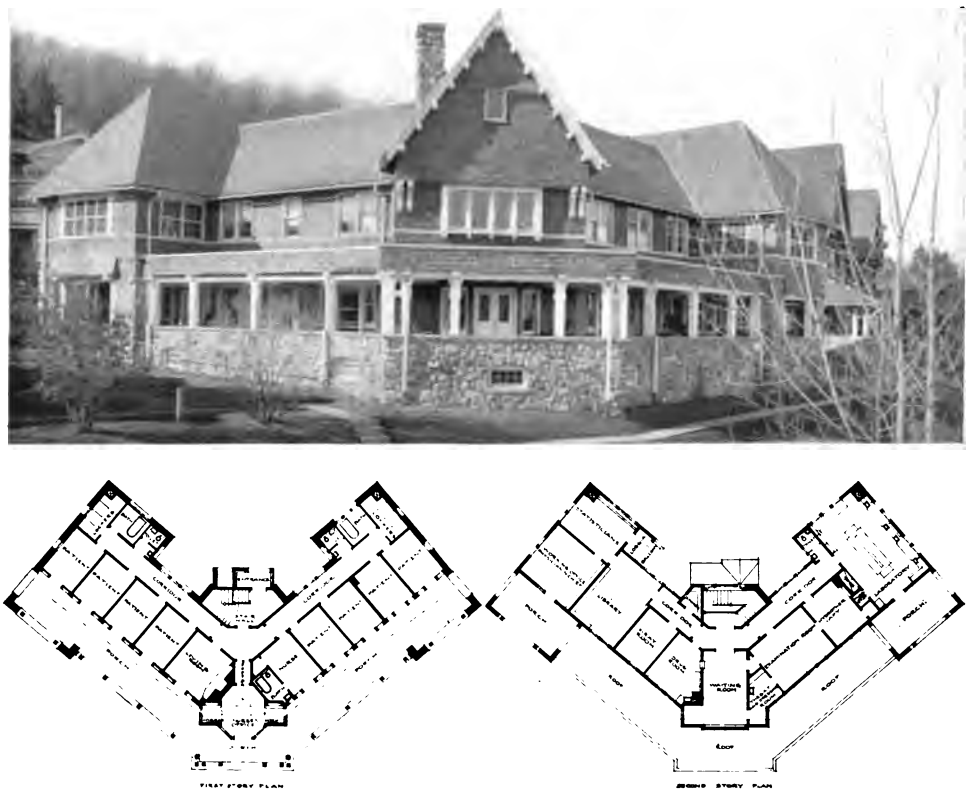
The second story is also divided by a hall running through the centre of the building and arranged with rooms for the superintendent, physician and nurses, and two dressing rooms with toilets, baths and lockers. The infirmary is housed on two large porches 31 feet wide by 18 feet deep, one on the first and the other on the second floor, facing the south and protected on the west by windows, on the north by the wall of the building and on the south and east by canvas curtains. Each porch accommodates six patients, the lower for men and the upper for women. The building was carefully designed and

simply finished with round corners, smooth surfaces, tile and cement floors and enameled walls. It is heated by steam, well ventilated and cost $21,435.

Adirondack Cottage Sanitarium, Saranac Lake, N. Y., INFIRMARY AND MEDICAL BUILDING (Illustration 63). This building consists of a basement and two stories with walls of the foundation and first story constructed of native stone two feet thick. The second story is of frame with a shingled exterior, extra insulation against cold having been obtained by using two layers of paper and siding between the shingles and interior finish, which is plaster on wood lath.

Its peculiar right-angle shape is due to the position of the site, as there was not room enough on the land to place a straight structure. The width of the front is twenty-two feet at the angle, and the length of each side on the front is fifty-three feet and on the rear forty-six feet. The basement contains the heating plant, and a store room used in connection with the laboratory.

On the first floor are eight patients' rooms 9 feet wide by 13 feet deep, opening on to a porch 10 feet wide by 60 feet long, with a corridor five feet wide in the rear; a nurses'



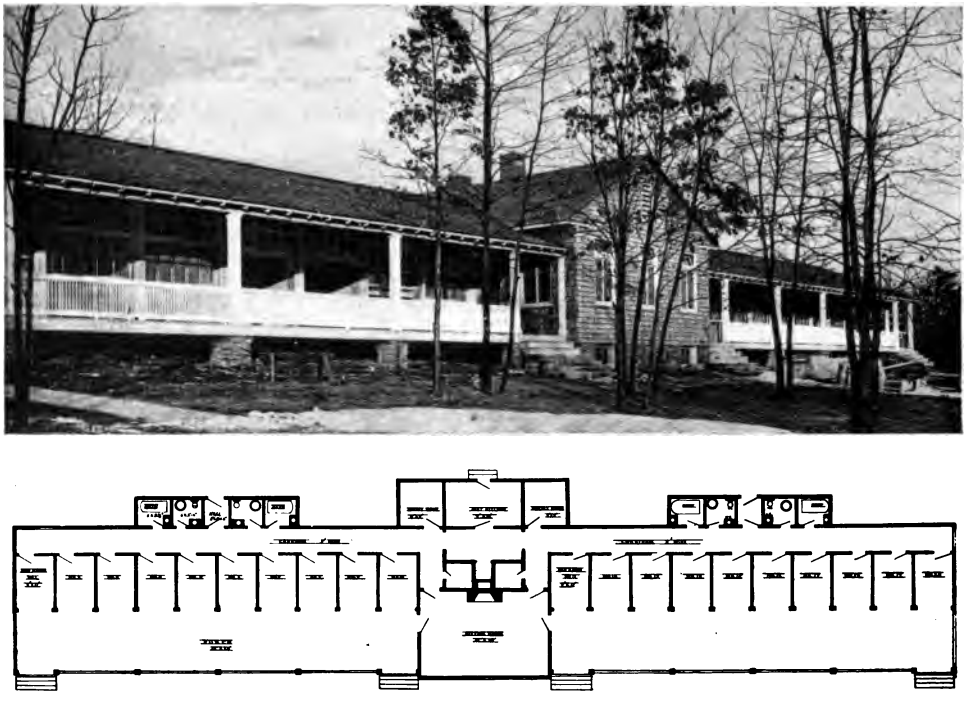
No. 63.—Adirondack Cottage Sanitarium, Saranac Lake, N. Y. SCOPES & FEUSTMANN, ARCHITECTS. INFIRMARY AND MEDICAL BUILDING. VIEW OF FRONT AND SIDE ELEVATIONS AND FLOOR PLANS. CAPACITY, 10 PATIENTS. COST, $26,000. (See frontispiece and illustrations 13, 98, 104 and 109 for further description of this institution.)

bedroom 9 feet wide by 13 feet deep, a sitting room 13 feet wide by 13 feet deep and a nurses' office in the angle 10 feet wide at the widest point and 13 feet deep. In the corners of this office next to the windows are mirrors so arranged that the nurse sitting at a desk in the centre of the room is able to overlook both porches. In the rear of the corridor are lockers, baths and toilets, a hall, stairway and the main entrance.

The second floor is divided into a laboratory 27 feet long by 16 feet wide, a treatment room 10 feet wide by 13 feet deep, an examination room 13 feet wide by 17 feet deep, a throat room 8 feet wide by 9 feet deep, a patients' waiting room 11 feet wide by 18 feet deep, a drug room 10 feet wide by 13 feet deep, an *x*-ray room 9 feet wide by 13 feet deep, a doctor's office 14 feet wide by 15 feet deep, a statistician's office 12 feet wide by 15 feet deep and two porches 11 feet wide by 20 feet deep, on which the medical staff work on pleasant days.

In order to economize on the cost of construction, this structure was made to combine the purposes of an infirmary, reception hospital and medical building. All patients when first arriving at the sanitarium are cared for on the first floor while the second floor is used for the work of the medical and laboratory staff. One interesting feature of the building is the arrangement of the transoms in the patients' rooms over the roof of the porch. This overcomes the disadvantage of shutting out the sunlight when rooms are flanked by a continuous porch, but it can only be planned for when patients are housed on one floor. The building has a capacity for ten patients and cost $26,000.

Maryland State Sanatorium, Sabillasville, Md., INFIRMARY BUILDING (Illustration 64). This building is of frame construction, placed on a stone foundation, and



No. 64.—Maryland State Sanatorium, Sabillasville, Md. WYATT & NÖLTING, ARCHITECTS. INFIRMARY BUILDING. VIEW OF FRONT ELEVATION, AND FLOOR PLAN. CAPACITY, 20 PATIENTS. ESTIMATED COST, $18,000. (See illustrations 3 and 75 for further description of this institution.)

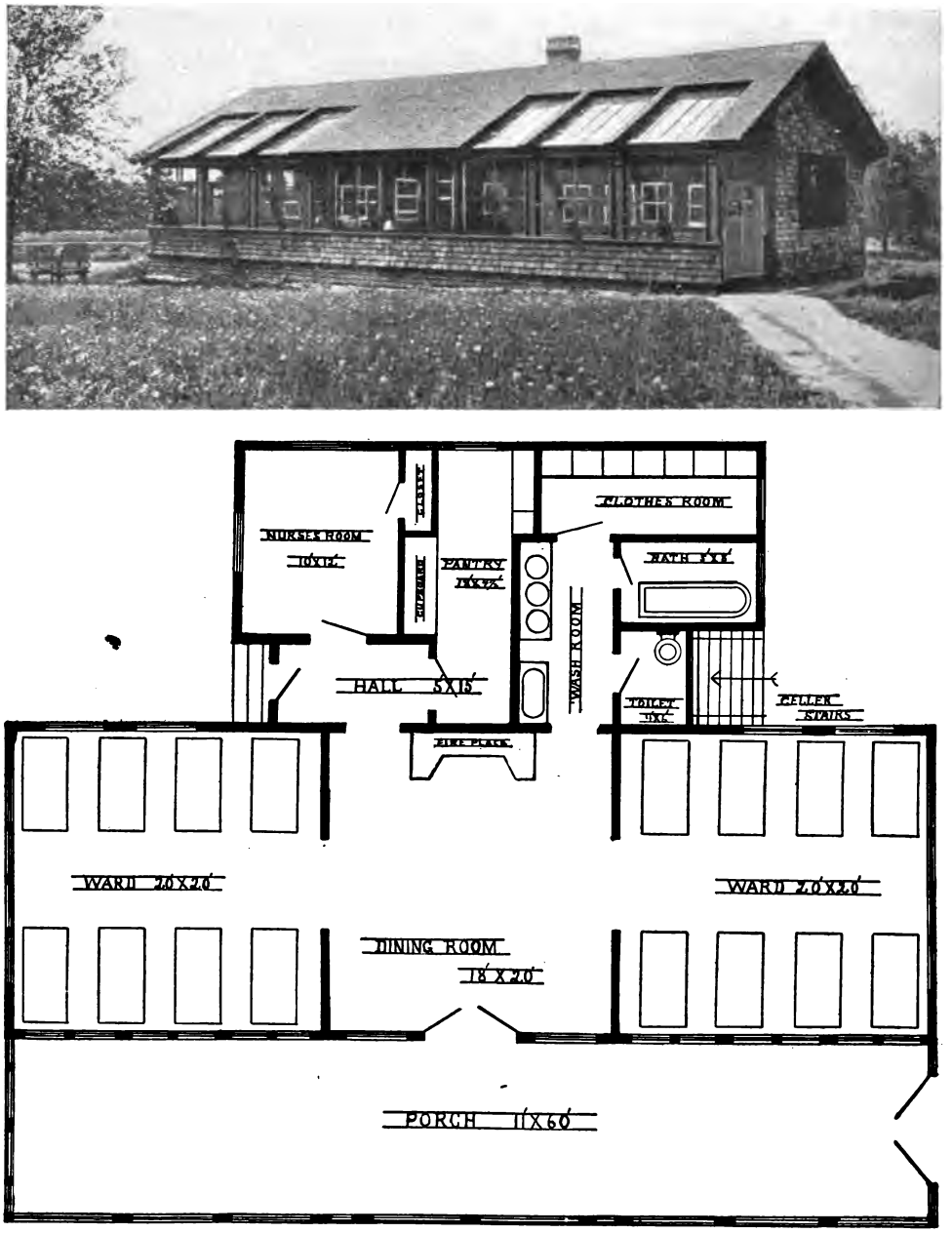
No. 65.—Georgia State Sanatorium, Alto, Ga. SCOPES & FEUSTMANN, AND WALTER W. JUDELL, ASSOCIATED ARCHITECTS. INFIRMARY BUILDING. VIEW OF FRONT ELEVATION, AND FLOOR PLAN. CAPACITY, 24 PATIENTS. COST, $18,000. (See illustrations 4 and 78 for further description of this institution.)

stone piers, and covered on the exterior with shingles. It is designed on the same lines as the lean-tos for housing the incipient patients at this institution.

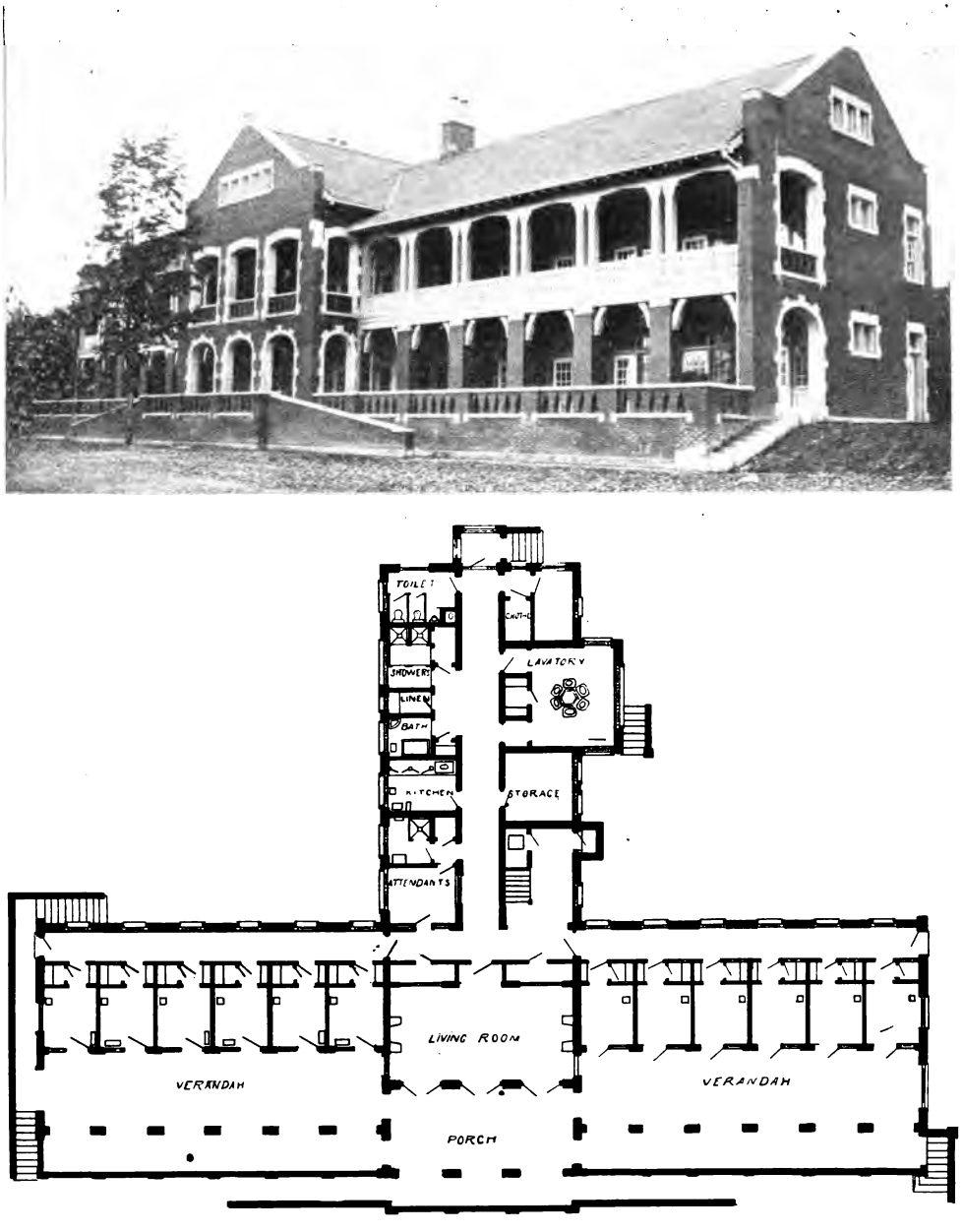
It consists of a central section, two wings and three small rear extensions, and is 195 feet long on the front. The central section is 28 feet wide by 32 feet deep, containing a sitting room 25 feet wide by 18 feet deep and two small linen closets. The corridor runs the full length of the building and in its rear are three extensions, the one in the centre containing a nurses' room 9 feet wide by 9 feet long, a diet kitchen 9 feet wide by 16 feet long, and a store room 8 feet wide by 9 feet long. Those in the rear of the wings are 36 feet deep by 31 feet wide and contain the toilets and baths. The capacity is twenty patients at an estimated cost of $15,000.

Georgia State Sanatorium, Alto, Ga., THE INFIRMARY BUILDING (Illustration 65). This is a one story building with a basement, of frame construction, placed on a foundation of local stone 18 inches thick. It is covered with shingles on the outside, having one thickness of siding and building paper over the studs and plastered on the inside over wood lath. It is 150 feet long by 25 feet through the ends, and 37 feet wide through the centre which is divided by a large lounging hall 12 feet wide by 35 feet

long. This hall is cut at a right-angle by a corridor 7 feet wide and 92 feet long, uniting the two wards, which are both 24 feet wide by 29 feet deep and have a capacity of eight patients each. There are sleeping porches 10 feet wide by 34 feet long, for six patients each, at the ends of the building, a porch 12 feet wide by 41 feet long for eight patients on the south, and two porches both 10 feet wide by 20 feet long, for two patients each, on the



No. 66.—Danvers State Hospital, Hawthorne, Mass. Designed by Dr. F. Page. Pavilion; View of Front and Side Elevation and Floor Plan. Capacity, 16 Patients. Estimated Cost, $6,000.



No. 67.—Ohio State Sanatorium, Mount Vernon, Ohio. F. L. PACKARD, ARCHITECT. RECEPTION HOSPITAL. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 24 PATIENTS. ESTIMATED COST, $30,000. (See illustration 77 for further description of this institution.)

north. In addition to the wards there are six private rooms 9 feet wide by 13 feet deep, and conveniently placed locker rooms, toilets, baths, linen closets and a diet kitchen. The structure was planned so that it could be used as a temporary administration building, and then easily and economically turned into a well laid-out infirmary. The architect designed the infirmary first and then worked out the arrangement for administrative pur-

poses for which it is now being used. The ward on the east end was converted into a dining room and the sleeping porch beyond enclosed for a kitchen and pantry, and the north porch enclosed for a staff dining room. The ward on the west end was cut down to a capacity for six patients and the remaining space converted into sleeping rooms for two nurses. The balance of the building as constructed will not be changed. When converted into an infirmary it will have a capacity of twenty-four patients. The cost of construction was $18,000.

Danvers State Hospital, Hawthorne, Mass., TUBERCULOSIS PAVILION (Illustration 66). This pavilion was erected to house insane tuberculous patients, but is well arranged for use as a reception cottage if small observation wards are desired. It is 60 feet wide by 32 feet deep, with a rear extension 35 feet wide by 18 feet deep and is of frame construction, covered with shingles and heated with steam. The pavilion contains a large, well screened porch 11 feet wide by 60 feet deep, opening into a dining room 18 feet wide by 20 feet deep, with two small wards 20 feet wide by 20 feet deep, for eight patients each, on either side. At the rear of the dining room is an extension containing the attendants' room, pantry, toilet and bath. The arrangement of the porch is interesting as it is structurally a part of the building and the glass in the roof is an unusual feature.

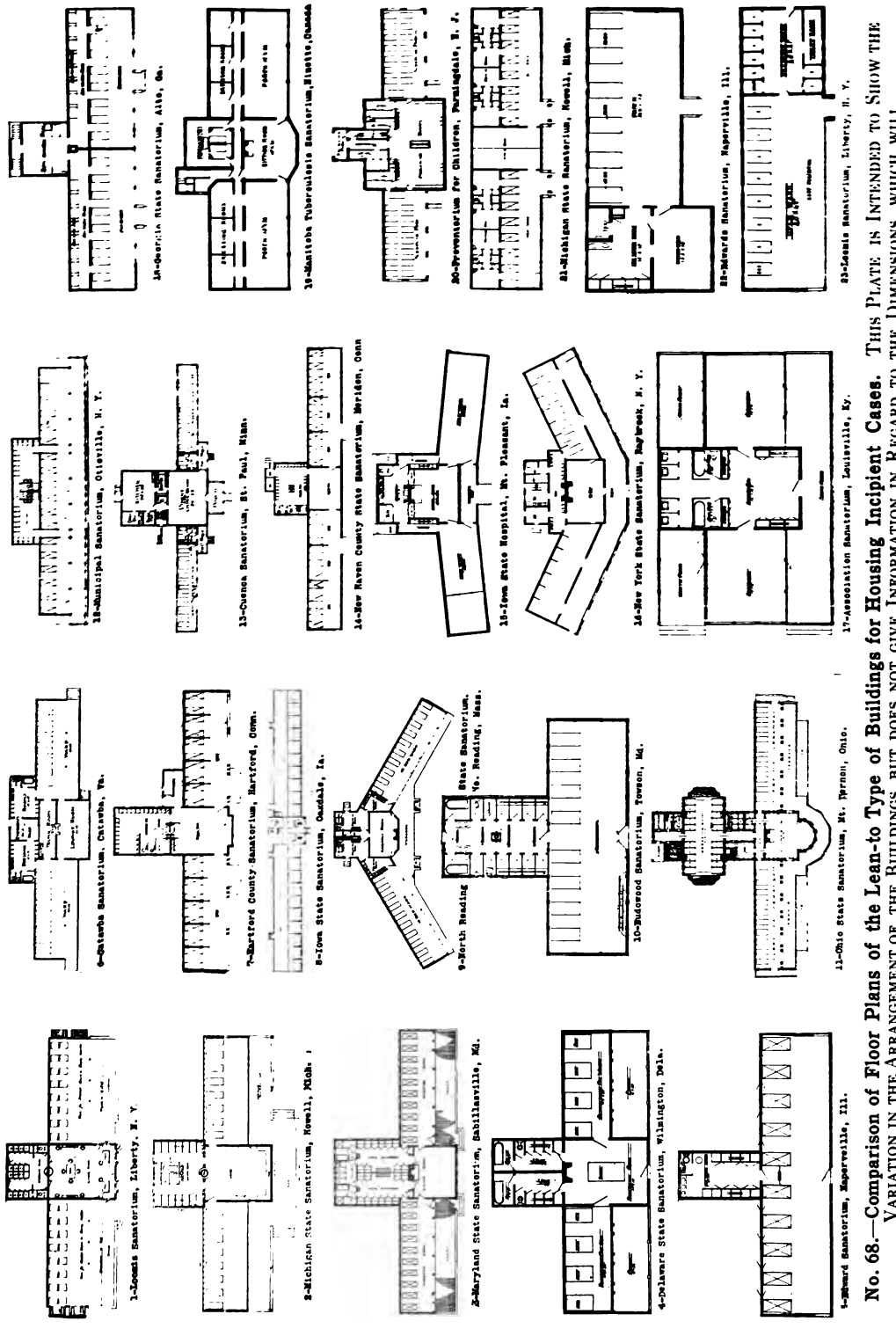
The capacity is sixteen patients, at an estimated cost of $6,000.

Ohio State Sanatorium, Mt. Vernon, Ohio, RECEPTION HOSPITAL (Illustration 67). This building is two stories high, constructed of brick, on a concrete foundation, with white stone trimmings, and a tile roof, 147 feet long and 37 feet through the wings. Both stories have the same general floor plan, consisting of a central section, two wings and a rear extension. In the centre is a living room 31 feet wide by 15 feet deep, with a porch or loggia on the front 31 feet wide by 13 feet deep. The wings are divided into six single rooms 8 feet wide by 10 feet deep, with a corridor five feet wide at their rear and a porch or loggia 12 feet wide by 55 feet long on the front. The rear extension is 32 feet wide by 59 feet deep, divided by a corridor in the centre six feet wide, with rooms on either side used for toilets, baths, storage and attendants.

The building has a number of good features. It is well constructed and the patients are housed in separate rooms. The arrangement of the passageways, corridors and the patients' closets are convenient and should be noted. It has a capacity of twenty-four patients at an estimated cost of $20,000.

SECTION V

Patients' Quarters—Lean-to Type of Building



No. 68.—Comparison of Floor Plans of the Lean-to Type of Buildings for Housing Incipient Cases. This Plate is Intended to Show the Variation in the Arrangement of the Buildings, but does not give Information in Regard to the Dimensions, which will be Found in the Text Describing the Institutions.

SECTION V

Patients' Quarters—Lean-to Type of Building

This section is a study of the growth and changes made in the lean-to type of building since it was first adopted for housing incipient tuberculous patients. The many modifications have tended to increase the capacity rather than to change the form. In some instances the expansion has been upwards, while in others the porches have been lengthened. A building of this design can be cheaply constructed and has proven to be comfortable and serviceable both when put up in a rough way for incipient cases, and when well constructed and finished on the interior for advanced cases.

Origin of the Lean-to

The idea of housing tuberculous patients in lean-tos was first suggested by Dr. Herbert M. King, of Loomis Sanatorium. He took as his model the old-time Adirondack lean-to camp, which is usually built of a framework of poles covered with bark, and describes his first building as a shed with an overhanging roof, open in front, with the ends constructed to be opened or closed as occasion demands. In the back wall were three openings in which were placed stationary slat blinds, intended to increase the circulation of air, but which produced too direct a draught for use in winter. The building had a floor space 12 feet wide by 40 feet long, giving room for eight 30-inch beds, and was constructed of plain lumber neither painted nor stained on the interior and covered externally with cedar shingles. In order to make it serviceable for the winter it was necessary to provide a heated dressing room near at hand. This was obtained by an addition placed directly behind the lean-to and fitted with toilets and wash basins and heated by a stove surrounded by a water coil which provided hot water for toilet purposes.

Later the design for this simple structure was modified, and a larger and more elaborate building constructed. This consists of two lean-tos placed end to end, somewhat wider than the original, and connected by a sitting room for use in bad weather, with a double locker and dressing room directly back of it in an extension. The advantage obtained by this improvement over the first building was ample space for reclining chairs at the foot of the beds, protected from the weather, a warm sitting room and a larger dressing apartment.

In designing and constructing lean-tos for housing incipient patients the following points should be considered.

Material

Shall the lean-to be constructed with material that will make a fairly permanent and comfortable structure? It would seem as if the funds available must settle this question, for good results are obtained from the open-air treatment in cheap buildings, although some of them are only shacks without plumbing or heating arrangements, where the patients use the old style wash-bowl and pitcher, or go to a small central building

for toilet, washing, and bathing facilities. During the early stages of pulmonary tuberculosis, patients usually stand the exposure to cold weather on the porches very well if they have a heated apartment near at hand to which they can go for dressing and toilet purposes and in order to get warm. The objection made to cheap lean-tos is that they are not substantial, permanent buildings, and cost more to maintain in good order than the more costly structures. On the other hand, it is contended that they can be torn down and rebuilt on the same lines a number of times for less money than it costs to erect a permanent structure which may become out-of-date. There is no doubt that a happy mean exists between the extremes of a shed with little in the way of comforts, costing $50.00 to $75.00 per patient, and some of the elaborate buildings classed as lean-tos which cost from $400.00 to $800.00 per patient.

Lean-tos are usually built of frame construction, consisting of a frame made from timbers to which sheathing is nailed and in turn covered externally with shingles or one of the patent board sidings. When well seasoned hard pine timbers are used for the columns and beams of the porch frame, and planks such as are specified in mill construction placed in the floor and roof, the result is a fairly substantial and permanent building. The roof is usually covered with shingles, but tin, slate, tile or one of the patent roofing materials will give good service.

Floors

In the sitting room the material for the floors should be hard wood or well laid and seasoned ordinary floor boards, covered with linoleum. The latter gives good satisfaction and rugs can be used over it. In the extension and dressing rooms, a flooring should be used which will not be affected by water, such as one of the composition materials in which cement is the predominating element, ordinary cement flooring, tile, terrazzo, or a carefully

No. 69.—Catawba Sanatorium, Catawba, Va. Designed by Dr. Ennion G. Williams. View of an Open Porch Illustrating a Method of Construction without Interior Finish, and a Manner of Protecting Porches by Canvas Curtains under the Edge of the Roof Projection. (See illustrations 17, 30 and 80 for further description of this institution.)

No. 70.—North Reading State Sanatorium, North Reading, Mass. JOHN A. FOX, ARCHITECT. VIEW OF AN OPEN PORCH, ILLUSTRATING A METHOD OF PROTECTING PORCHES BY CANVAS CURTAINS IN STORMY WEATHER. (See illustration 87 for further description of this institution.)

laid board floor covered with battle-ship linoleum or modern cork matting, glued down and turned up at the base line. These last are durable, noiseless and non-absorbent.

Finish

The sitting room interior can be finished either by sealing the walls and ceilings with narrow boards laid over one or more thicknesses of building paper or by plaster over wood or metal lath. Both of these methods are satisfactory; the boards when used should be varnished, or the plaster covered with oil paint.

In the rear extension or dressing rooms hard, smooth plaster over metal lath is a good finish and this should be painted and covered with coach varnish, and the walls for about five feet up from the floor protected by tile, or imitation tile made of metal covered by enamel.

The finish for the interior of the porches depends upon individual taste and need for economy. The timbers may be left exposed in the rough, planed, painted, stained, or sealed with boards and varnished.

Excavation

Basements and cellars do not afford the most sanitary means of obtaining storage and extra room in hospital buildings, and excavations can be eliminated by raising lean-tos off the ground one to three feet on stone, brick or concrete piers. If there is reason to fear dampness a layer of concrete about three inches thick should be spread upon the ground under the building.

Exposure

The placing of the building in its relation to the points of the compass is important. Usually the exposure of the porches should be south-east rather than due south in tem-

perate climates, for since the lean-to has become popular it has been found that the air in the porches with direct southern exposure often gets exceedingly hot, and sometimes unbearable during the middle of the day and the early afternoon, in the summer months, causing the patients great discomfort. In hot countries and where the summer temperature remains high for hours at a time, lean-tos should have two porches for each group of patients, one having a southern and the other a northern exposure.

Arrangement of Floor Plans

In selecting a floor plan or designing a new lean-to, care should be taken to have the rear extensions large enough to give space for a storage room, a linen closet, a warming closet in which blankets can be quickly dried and warmed, and large individual lockers 3 feet wide by 3 to 5 feet deep. In many of the earlier constructed lean-tos the lockers are often not more than 12 inches wide by 12 inches deep, too small to allow any privacy to the individual. It should now be definitely understood that no building for the housing of incipient patients is complete unless it provides adequate facilities to each person for privacy. The latest lean-to constructed at the Loomis Sanatorium is a good illustration of one method of meeting this need with a large locker or a small private dressing room.

The arrangement of the porches is also being modified in order to reduce the number of patients housed together. Large porches should have partitions erected in order to divide the patients into small units. Two patients in a small cubicle about 10 feet wide by 8 feet deep seems to be the most satisfactory arrangement.

The rear walls in many cases are too low. This is a mistake, as it is hard to ventilate a lean-to built in this manner, and causes the patients discomfort when moving about quickly. At least eight feet in the clear should be allowed.

Porch Space

The width of the floor space and roof projection should be ample, as the porch of the lean-to provides the living quarters of the patients. Room to move about

No. 71.—Virginia State Farm, Richmond, Va. View of Open Porch Illustrating Manner of Protecting Porches by Canvas Curtains Placed between Pillars, a Few Feet Back from the Line of the Roof Projection.

No. 72.—Loomis Sanatorium, Liberty, N. Y. VIEW OF CHAPMAN COTTAGE. SLEEPING PORCH; ILLUSTRATING METHOD OF CONSTRUCTION AND INTERIOR FINISH, USING NARROW FLOOR BOARDS FOR SEALING. (See illustrations 1, 73, 91 and 108 for further descriptions of this institution.)

freely at the foot of their beds and a clear space for a reclining chair are necessary. The depth of the porch is also one of the best protections against storms and high winds, and should be three times the length of the bed, eighteen feet or more from the rear wall to the front line.

Porch Protection

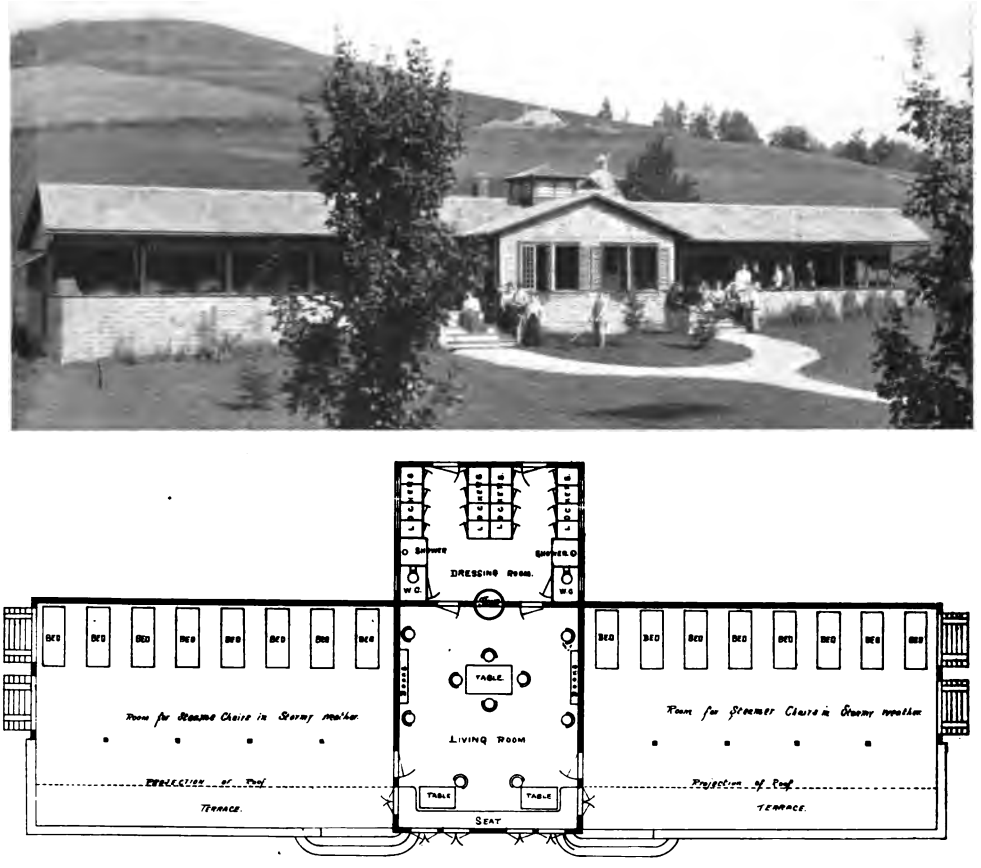
The front of the porch is usually protected by canvas curtains hung on rollers, Japanese matting, glass and sash windows which can be raised and lowered, or glass doors which can be opened and closed. The rear and end openings are generally protected by sliding windows known as the "barn-door" shutter, ordinary glass and sash windows hung either at the side or from the top, or a frame covered with canvas hung on hinges or on a pivot.

Ventilation

Ventilation is one of the most important questions to be considered when planning lean-tos, for it is about as hard to obtain a current of air in a room with an open front as it is in a room enclosed by four walls. When cross-ventilation is not obtained the air becomes very bad at the back of the porches. This can be prevented if special care is taken to secure cross currents of air, by windows cut in the side and rear walls, or by openings above the porch roof which remove the foul air close to the ceiling.

Fixtures and Plumbing

Good substantial sanitary fixtures should be used in the dressing rooms, allowing one toilet and one wash-basin to every four, and one shower or bath tub to every eight patients. Plumbing should not be installed in cheap lean-tos in northern climates unless it is well



No. 73.—Loomis Sanatorium, Liberty, N. Y. ORIGINAL IMPROVED LEAN-TO. DESIGNED BY DR. HERBERT MAXON KING. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 16 PATIENTS. COST, $1,830. (See illustrations 1, 72, 91 and 108 for further description of this institution.)

protected, or frozen pipes will give much trouble during the winter months. It is not advisable to make arrangements for heating porches to be used by incipient patients, as it has been found that expensive heating plants provided for this purpose are rarely used.

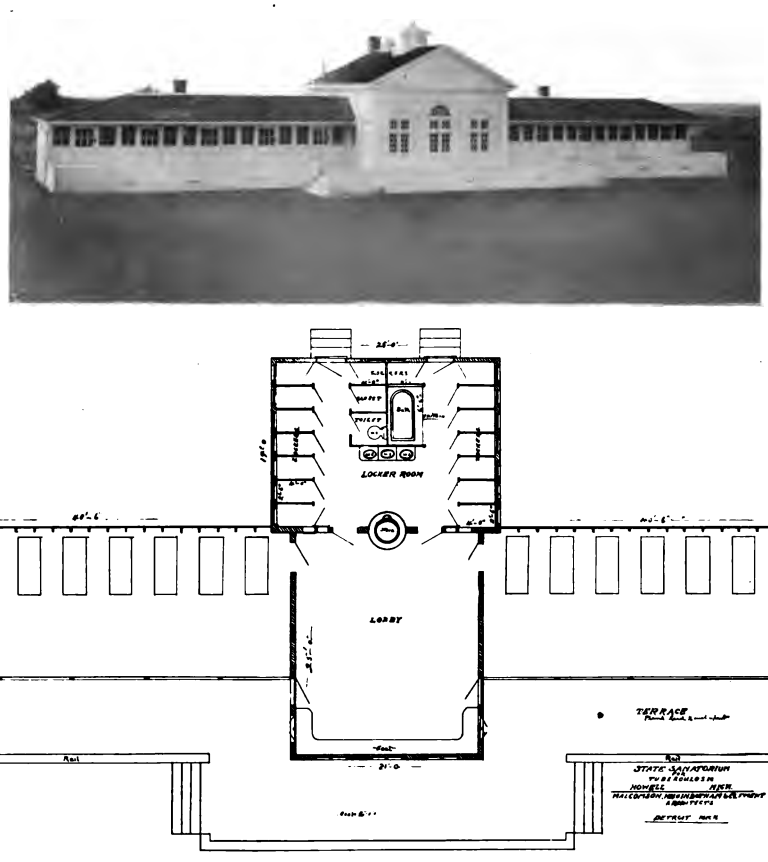
A comparison of the various floor plans of lean-tos described in this section is shown in illustration 68.

EXAMPLES OF LEAN-TOS

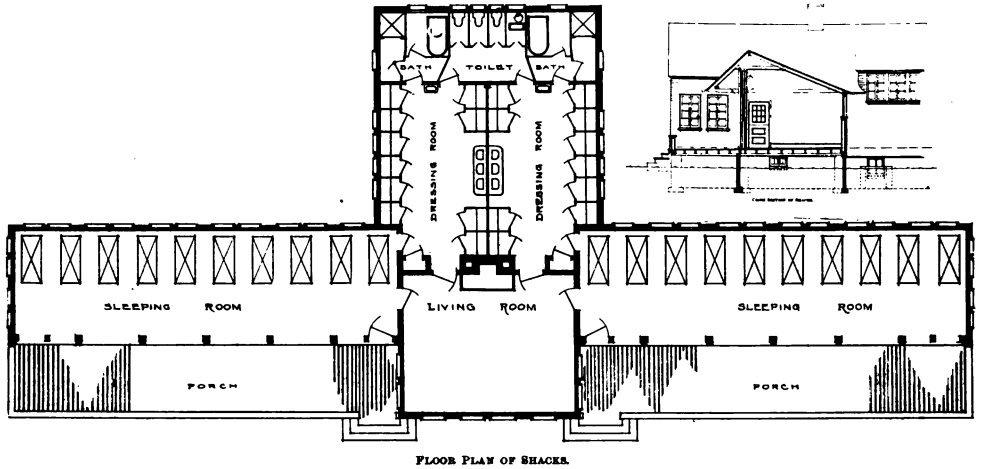
Loomis Sanatorium, Liberty, N. Y., THE IMPROVED KING LEAN-TO (Illustration 73). This building is 100 feet long by 25 feet deep, of frame construction, placed on stone piers and covered externally with cedar shingles left to weather stain. It is the original structure used as the model for the lean-to type of building. The sitting room in the centre is 20 feet wide by 25 feet deep, and the dressing room directly back of it is 20 feet wide by 14 feet deep, both being heated by a large stove which also supplies hot water for the baths and hand basins. The interior finish of the centre apartment is hard pine, filled and var-

nished. The length of the porches is forty feet, the extent of the roof projection twenty feet, which depth is a great help in keeping out a driving storm. They are simply and cheaply constructed, the 2 x 4 timbers supporting the walls and roof are left uncovered, and the smooth surfaces are painted with the exception of the floor, which is laid in the ordinary way except where exposed to the rain. In these places it is made of three inch material with one-half inch spacing between each plank, the edges being slightly rounded, to prevent curling. The building faces the south and during storms the porches are enclosed by canvas curtains on rollers which can be raised or lowered. The building has a capacity of sixteen beds and cost $1,830.

Michigan State Sanatorium, Howell, Mich., LEAN-TO (Illustration 74). This building is placed on stone piers, of frame construction, with a shingled roof, 102 feet long by 25 feet wide through the wards. The rear extension is 25 feet wide by 19 feet deep and the entire floor plan is similar to the improved King lean-to, but with a different arrangement of the lockers, toilets and baths. The building is also better finished and more substantially constructed, having glass and sash windows to enclose the wards, a large terrace in front and more commodious dressing rooms. The capacity is sixteen beds and the cost of construction was $4,500.



No. 74.—Michigan State Sanatorium, Howell, Mich. MALCOMSON, HIGINBOTHAM AND CLEMENT, ARCHITECTS. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 16 PATIENTS. COST, $4,500.



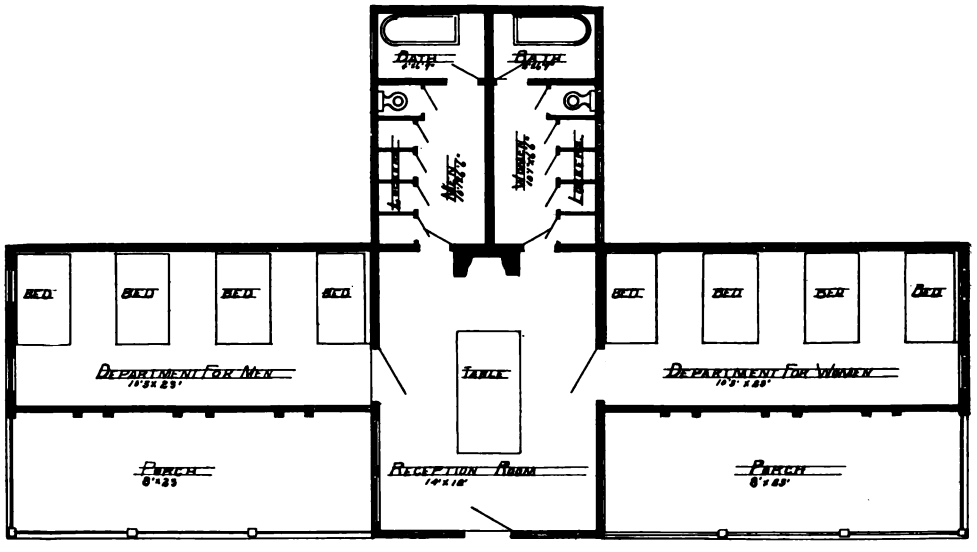
FLOOR PLAN OF SHACKS.

No. 75.—Maryland State Sanatorium, Sabillasville, Md. WYATT & NÖLTING, ARCHITECTS. LEAN-TO. VIEW OF FRONT ELEVATION, FLOOR PLAN AND CROSS-SECTION. CAPACITY, 20 PATIENTS. ESTIMATED COST, $7,000. (See illustrations 3 and 64 for further description of this institution.)

Maryland State Sanatorium, Sabillasville, Md., LEAN-TO FOR INCIPIENT PATIENTS (Illustration 75). This building is of frame construction, placed on brick piers, both the roof and exterior walls being covered with shingles and stained. The trimmings around the windows are painted white and the interior sealed with narrow boards and varnished. The structure is 123 feet long by 26 feet deep through the wings, which are divided into a ward for ten patients, 16 feet wide by 50 feet long, with porches ten feet wide on the front. The rear extension is 32 feet wide by 30 feet deep and is divided into three apartments, two dressing rooms, 14 feet wide by 22 feet long, arranged to give each patient a private dressing alcove containing a set of drawers, and space for hanging clothes, and a toilet room 31 feet wide by 10 feet deep, containing ample bathing facilities as well

as toilets and lavatories. The sitting room between the wards is 22 feet wide by 18 feet deep, finished in the same manner as the other parts of the interior.

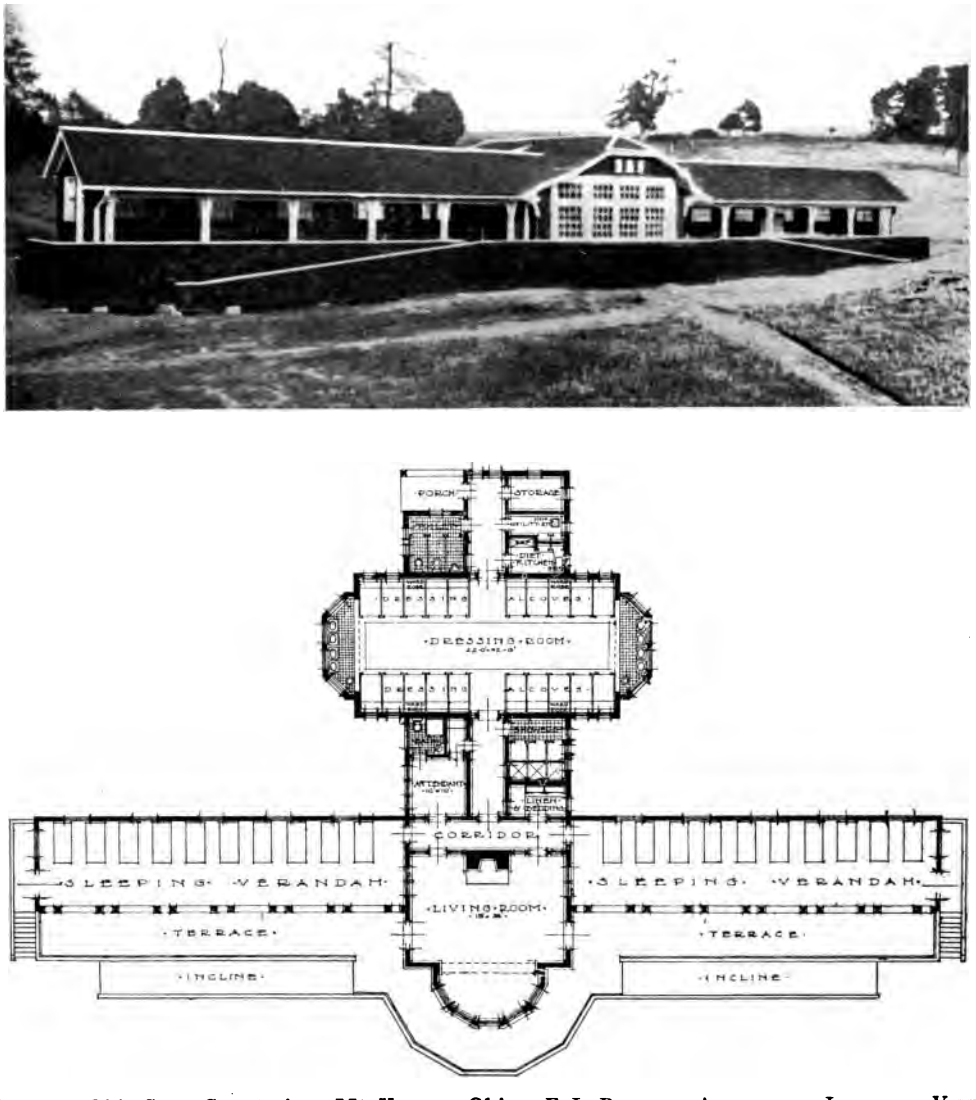
There are ten of these buildings grouped about an administration building, which is described in Section II of this book. They all face the south, every room having light and air from opposite sides, and are alike with the exception of the finish. The wards have a number of windows in the rear and side walls, and are protected in front by large sliding glass and sash frames placed between the columns which can be pushed up and out of the way allowing the wards to become part of the porches. These lean-tos were built to house incipient tuberculous cases, but they are so well planned and constructed that they could be used for advanced cases. Institutions such as small town or county hospitals that need an isolated ward for advanced cases could use this building as a model, and by



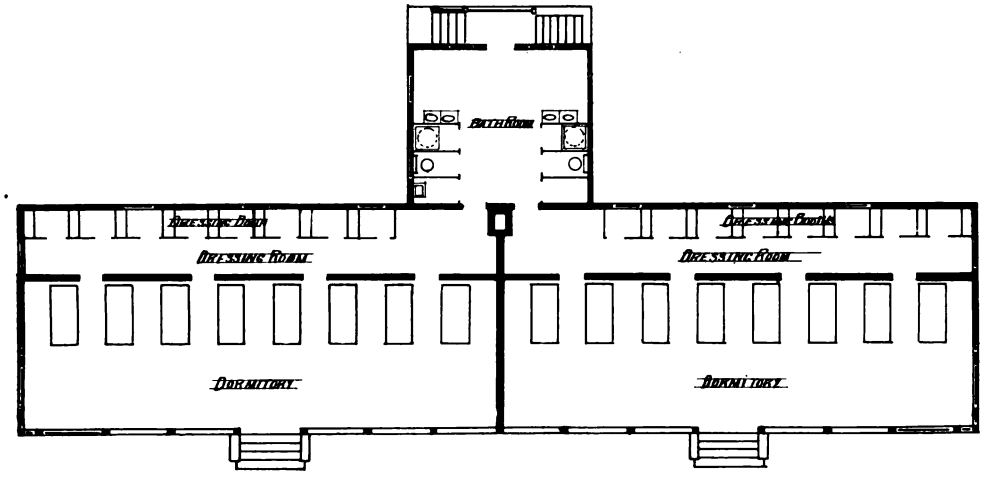
No. 76.—Delaware State Sanatorium, Wilmington, Del. J. & M. Kennedy, Architects. Hebrew Society Lean-to. View of Front Elevation and Floor Plan. Capacity, 8 Patients. Estimated Cost, $1,000.

dividing the wings into single rooms and using the same interior finish, obtain a substantial pavilion for a comparatively small outlay. The capacity is twenty patients and the cost of construction about $7,000.

Delaware State Sanatorium, Wilmington, Del., HEBREW SOCIETY'S LEAN-TO (Illustration 76). This is a frame building, on stone piers, covered externally with clapboards and roofed with shingles, 61 feet long by 19 feet deep, having a rear extension 14 feet wide by 15 feet deep. This little building was erected to house a few patients of both sexes, and is divided into a central sitting room 14 feet wide by 18 feet deep, two small



No. 77.—Ohio State Sanatorium, Mt. Vernon, Ohio. F. L. PACKARD, ARCHITECT. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 20 PATIENTS. ESTIMATED COST, $6,500. (See illustration 67 for further description of this institution.)



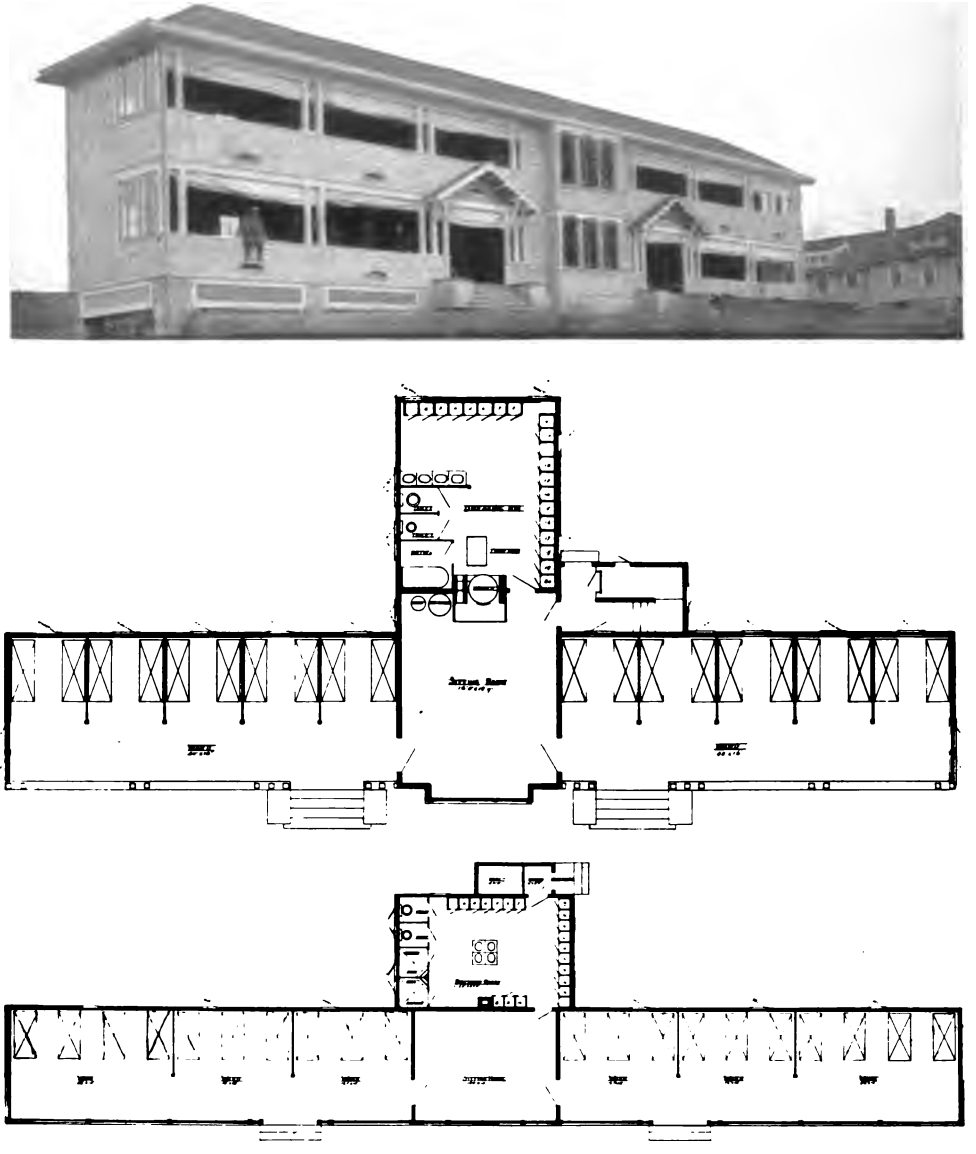
No. 78.—Georgia State Sanatorium, Alto, Ga. SCOPES & FEUSTMANN, AND WALTER W. JUDELL, ASSOCIATED ARCHITECTS. DESIGN FOR A LEAN-TO. FLOOR PLAN. CAPACITY, 16 PATIENTS. ESTIMATED COST, $2,500. (See illustrations 4 and 65 for further description of this institution.)

wards 10 feet wide by 23 feet long, for four patients each, one for men and the other for women; with a porch in front 8 feet wide by 23 feet long, and windows for ventilating the ward above the roof. The rear extension is divided by a solid partition into two dressing rooms, each containing four lockers, a toilet and a bath for the use of the patients. The building has a capacity for eight patients and the estimated cost is $1,000.

Georgia State Sanatorium, Alto, Ga., LEAN-TO, FLOOR PLAN (Illustration 78). This plan was suggested for the lean-tos to be constructed at the Georgia State Sanatorium, and was designed to give each patient a small private dressing room directly in the rear of his bed. The building to be 103 feet long by 25 feet deep, constructed of frame placed on stone piers, divided into two open wards 16 feet wide by 51 feet long, a corridor 4 feet wide by 51 feet long, and sixteen private dressing rooms each 5 feet wide by 3 feet deep. The extension at the rear of the centre to be 23 feet wide by 17 feet deep and containing baths, toilets and lavatories. This building was planned to have a capacity for sixteen patients, without a central sitting room, and to cost about $2,000.

Ohio State Sanatorium, Mt. Vernon, Ohio, LEAN-TO FOR INCIPIENT PATIENTS (Illustration 77). This building is constructed of frame, placed on concrete piers, with the exterior covered with shingles, having white trimmings. The building is 148 feet long and 24 feet through the wings and consists of a central section, two porches and a rear extension. It was designed after the lean-to type of structure, but has certain deviations from the usual plans which are worth considering, for it supplies all patients with individual dressing alcoves which add greatly to their comfort and are much appreciated.

The central section contains a living room 25 feet wide by 18 feet deep, with a corridor behind it connecting the two wings or sleeping porches, which are 60 feet long by 24 feet deep. The rear extension has a floor plan designed in the shape of a cross (this being the unique feature of the building) 56 feet deep by 27 feet wide; except through the

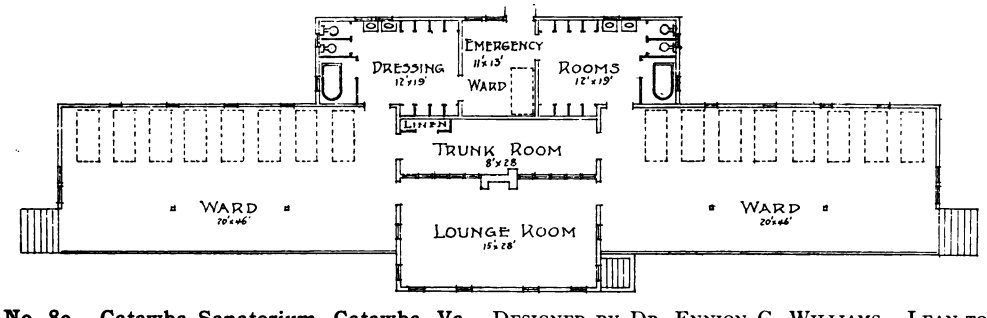


No. 79.—New Haven County State Sanatorium, Meriden, Conn. FOOTE & TOWNSEND, ARCHITECTS. LEAN-TO. FRONT ELEVATION AND FLOOR PLANS. NOTE.—THERE ARE TWO OF THESE BUILDINGS, EACH TWO STORIES HIGH, BUT WITH SLIGHTLY DIFFERENT FLOOR PLANS. CAPACITY, 40 PATIENTS. ESTIMATED COST, $5,000.

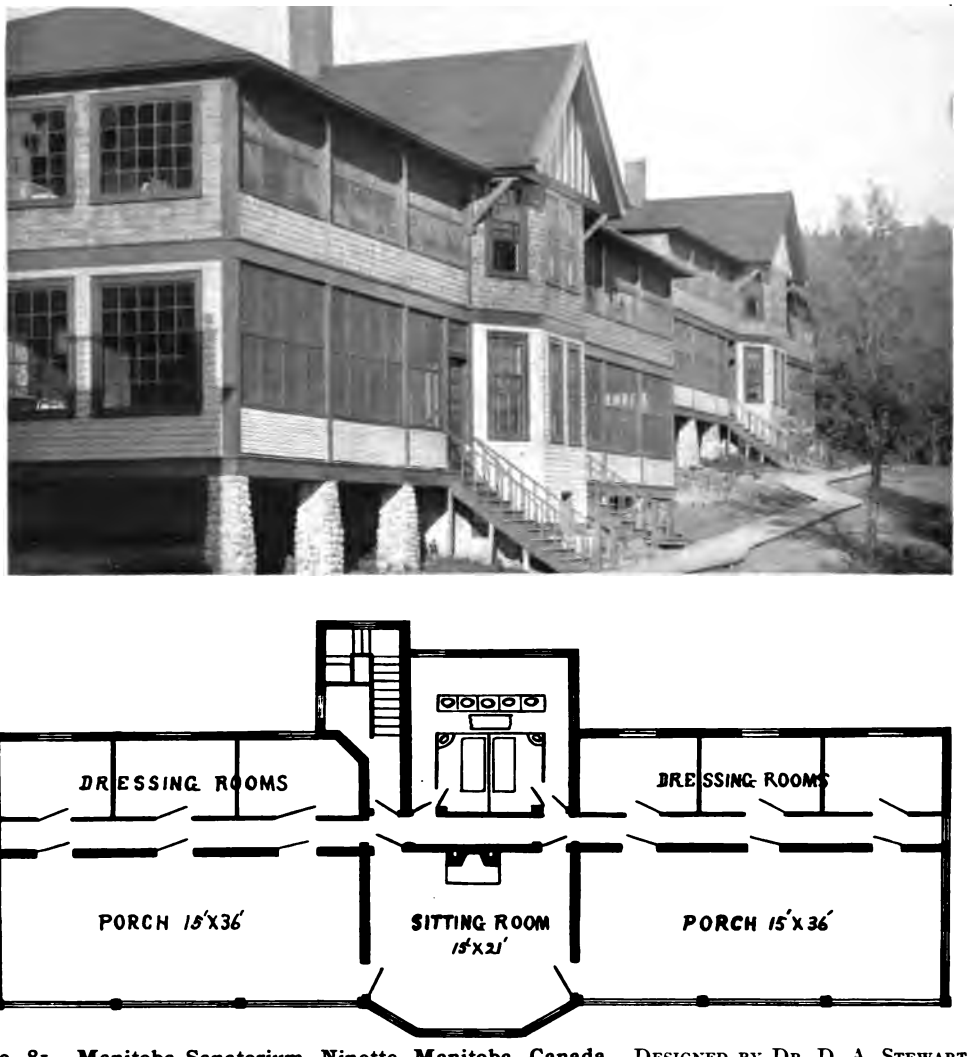
dressing room, which is 52 feet wide by 22 feet deep, situated in the centre and extending out on each side, making a break in the walls which increases the space used for windows. There are also more rooms in the rear extension than are usually planned for in lean-to structures, such as a linen closet, diet kitchen and nurses' room. The building has a capacity for twenty patients and the estimated cost is $6,500.

New Haven County State Sanatorium, Meriden, Conn., LEAN-TO (Illustration 79). There are two buildings of this design, one at Huntington, known as Building No. 3, and the other at Meriden. They are of frame construction, on stone piers, covered externally and roofed with shingles, two stories high and both having a front elevation practically of the same general appearance, with slight variations in the floor plans. The first and second floors of both buildings are alike and consist of a central section, two wings and a rear extension, one being 98 feet long by 16 feet deep with a rear extension 17 feet wide by 24 feet deep; the other 129 feet long by 15 feet deep with a rear extension 23 feet wide by 15 feet deep. The sitting room in the central section of one is 20 feet deep by 16 feet wide, and in the other 19 feet wide by 15 feet deep. The wings of both consist of a single ward with a capacity often patients, housed in separate cubicles 8 feet wide by 9 feet deep, for two patients, or for three, 16 feet wide by 9 feet deep. The front of the porches or wards is protected by canvas curtains and the rear walls pierced by windows to give cross-ventilation. The rear extensions are used as dressing rooms and contain individual lockers, wash-bowls, toilets and baths. These buildings illustrate well the latest methods of dividing the porches in order to house patients in small units. They have a capacity for forty patients at an estimated cost of $5,000.

Catawba Sanatorium, Catawba, Va., LEAN-TO (Illustration 80). This is a one story frame building, covered with siding and roofed with shingles, on a concrete foundation, 121 feet long by 20 feet deep, through the wings. The wards or porches are



No. 80.—Catawba Sanatorium, Catawba, Va. DESIGNED BY DR. ENNION G. WILLIAMS. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 16 PATIENTS. ESTIMATED COST, $2,000. (See illustrations 17, 30 and 69 for further description of this institution.)

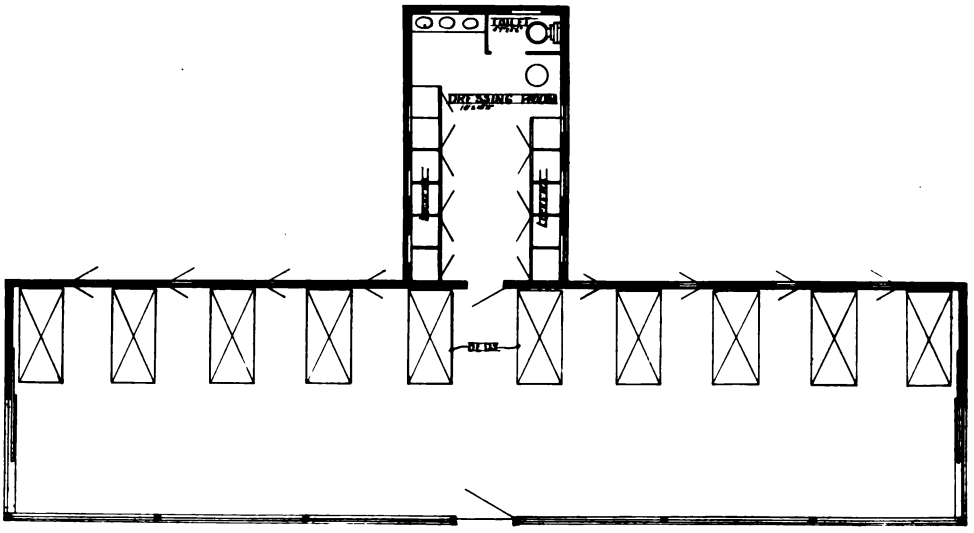


No. 81.—Manitoba Sanatorium, Ninette, Manitoba, Canada. Designed by Dr. D. A. Stewart. Lean-to. View of Front Elevation and Floor Plan. Capacity, 32 Patients. Estimated Cost, $8,000. (See illustration 25 for further description of this institution.)

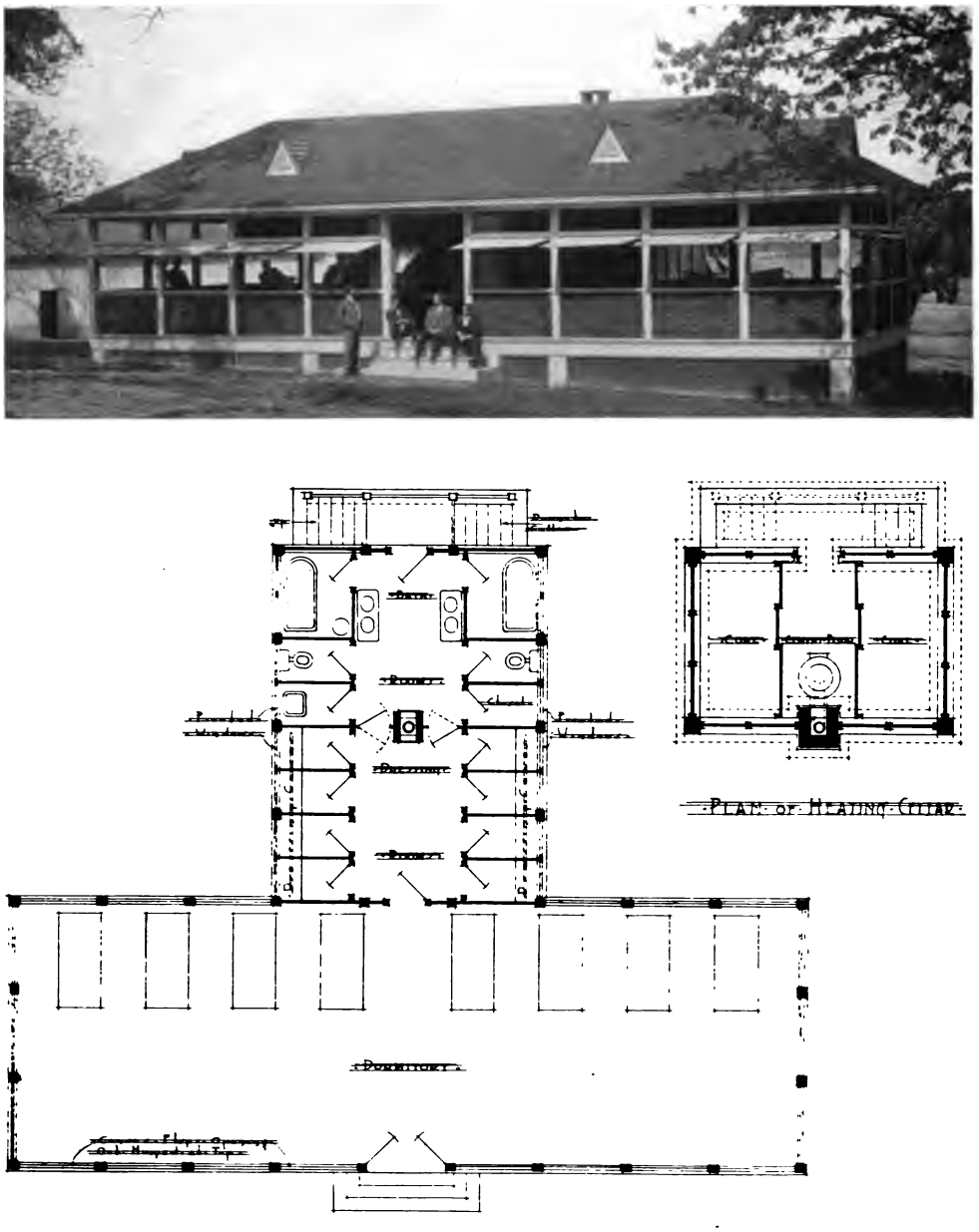
20 feet wide by 46 feet long, and the rear extension is 52 feet long by 12 feet deep. There is a sitting room 28 feet wide and 15 feet deep in the centre, with a trunk room 28 feet wide by 8 feet deep back of it. There are two dressing rooms 19 feet wide by 12 feet deep, and a small single bed ward 11 feet wide by 12 feet deep in the rear extension which is very conveniently arranged. The building has a capacity of sixteen patients and cost approximately $2,000.

Manitoba Sanatorium, Ninette, Manitoba, Canada, Lean-to (Illustration 81). This building is placed on a cement foundation and stone piers, two stories high, of frame construction, externally covered with shingles and trimmed with wood artistically painted, 94 feet long by 24 feet through the wings. The central section is 20 feet wide by 22 feet

long, and contains a sitting room furnished with a large fireplace, and a toilet room fitted with lavatories and baths. The wings of the building are 36 feet long by 24 feet deep, divided into open wards 36 feet long by 15 feet deep, with a corridor and three dressing rooms in their rear. Each floor is an independent unit for twelve patients and the building was constructed two stories in height in order to economize in heating, as the winters in Manitoba are very cold. There are two pavilions of the same type at this institution; the one housing women is shown in the illustration. The other, for men, has a slightly different floor plan, with only one large dressing room in the rear of the sleeping porch. The advantage claimed for this building is that the dressing rooms are closer to the patients and give them more privacy than in the usual lean-to type of structure. The cost of the building including its porportion of the heating plant, installation of plumbing, water supply and sewer connection was $8,000.



No. 82.—Edward Sanatorium, Naperville, Ill. W. A. Otis and Edward H. Clark, Architects. Lean-to. View of Front Elevation and Floor Plan. Capacity, 10 Patients. Estimated Cost, $1,800. (See illustrations 62 and 88 for further description of this institution.)



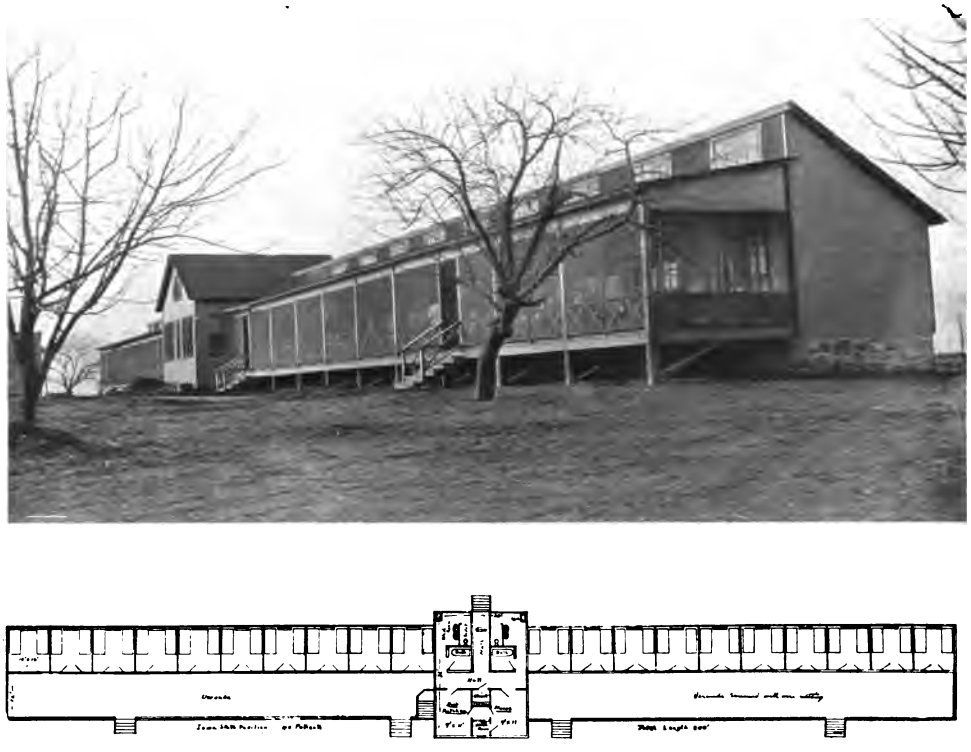
No. 83.—Eudowood Sanatorium, Towson, Md. ARCHER & ALLEN, ARCHITECTS. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLANS. CAPACITY, 8 PATIENTS. ESTIMATED COST, $4,000.
(See illustrations 22 and 61 for further description of this institution.)

Edward Sanatorium, Naperville, Ill., LEAN-TO (Illustration 82). This building is of frame construction, on brick piers, covered on the exterior and roofed with shingles. It is 64½ feet long by 16 feet wide, with a rear extension 18½ feet long by 11 feet wide. The front section consists of one ward and the building is illustrated to show the method of protecting its southern exposure and the means used to ventilate through the roof.

The north walls of the ward are pierced by eight windows and a door leading into the extension which is used as a dressing room and contains lavatories, toilets and lockers for each patient. It has a capacity of ten patients and cost $1,057.

The Eudowood Sanatorium, Towson, Md., GARRETT PAVILION OR LEAN-TO (Illustration 83). This is a frame structure raised on brick piers, covered externally with stained shingles and trimmed with white paint. It is an attractive building, arranged to receive the light and air from all sides through open spaces, between the columns supporting the roof, protected in stormy weather by canvas curtains stretched on frames and hung on pivots attached to the posts. The front is 56 feet long by 20 feet deep and consists of one large room used both for sleeping and living purposes. This opens into a rear extension 19 feet wide by 24 feet deep, provided with eight lockers (large enough to be small private dressing rooms 3 feet wide by 5 feet deep), two toilets, two baths and four washbasins, the whole making a comfortable and convenient apartment. The building has a capacity of eight patients and cost $4,000.

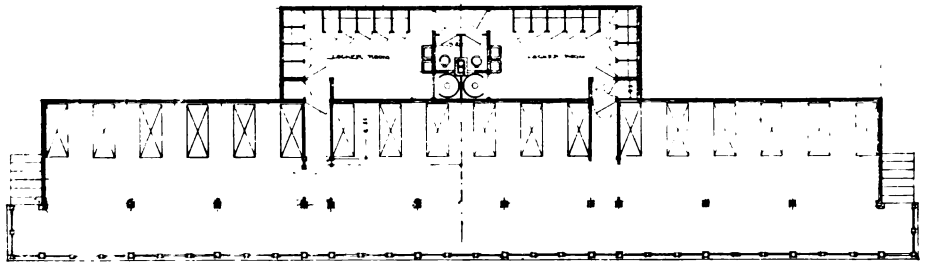
Iowa State Sanatorium, Oakdale, Ia., LEAN-TO (Illustration 84). This building is of frame construction, covered externally with siding, roofed with shingles, and placed on a stone foundation. In type it belongs to the lean-to group of buildings and was intended for incipient cases, but the wings are divided into enclosed rooms with sleeping porches in



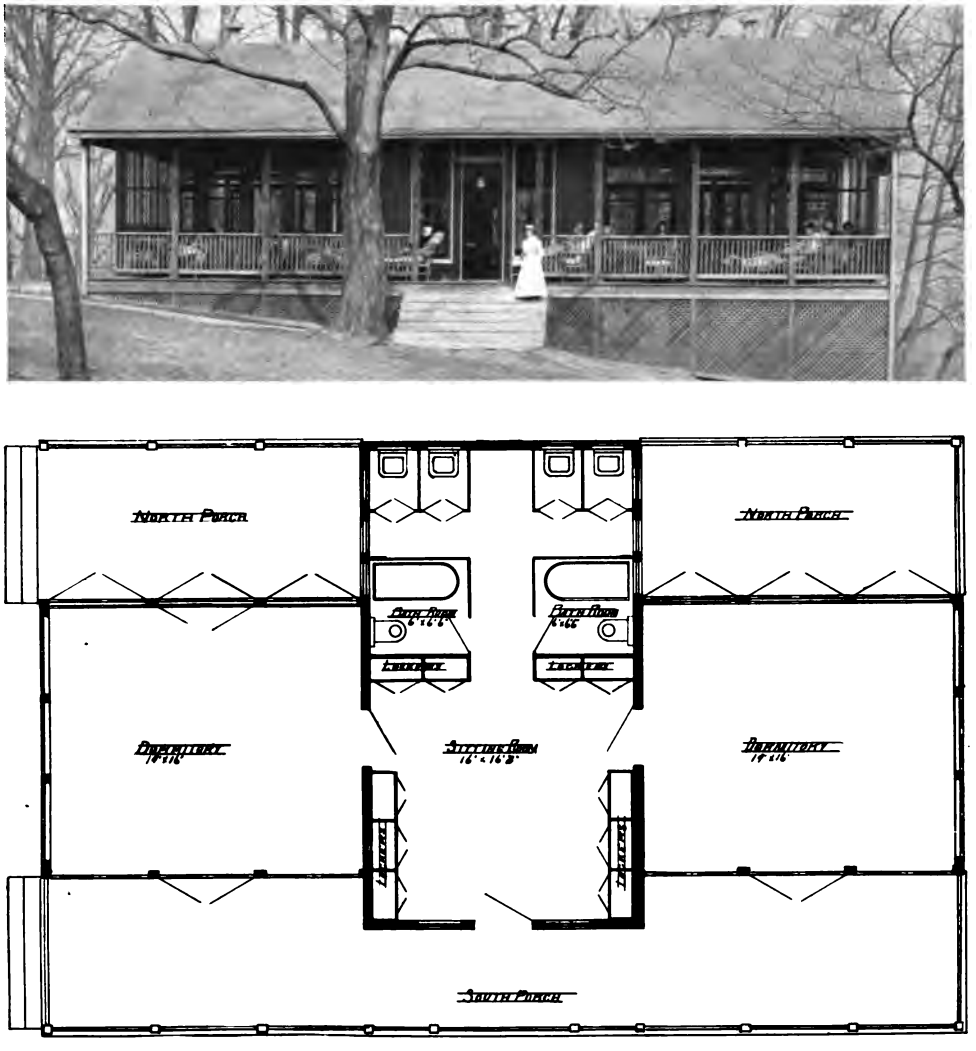
No. 84.—Iowa State Sanatorium, Oakdale, Ia. H. F. LIEBBE, ARCHITECT. LEAN-TO, 240 FEET LONG. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 40 PATIENTS. ESTIMATED COST, $8,000. (See illustrations 24, 29 and 103 for further description of this institution.)

front. It is 240 feet long by 24 feet deep. The veranda is twelve feet wide, enclosed with wire netting for protection against flies and mosquitoes. It is claimed that this building has been a success, but that it should have a larger central section and a rear extension so as to give better facilities for toilets, baths and locker rooms. It has a capacity for forty patients and the cost of construction was $8,000.

The Municipal Sanatorium, Otisville, N. Y., THE LEAN-TO (Illustration 85). This is a frame building on stone piers, 105 feet long by 18 feet wide, covered with shingles, stained artistically and trimmed with white. The front of the building consists of a long open porch or ward divided into three sections by half partitions, which do not obstruct the view of the entire porch from either end. The rear extension is 42 feet wide by 10 feet deep, containing two dressing rooms each 18 feet wide by 10 feet deep, with separate entrances from the porch. There is a small cellar excavated under the centre for a furnace which heats the dressing rooms. The building has no sitting room and should be placed near an amusement pavilion or some other structure having an apartment for this purpose. Its peculiar feature is a break in the roof projection at the front in which windows are placed to ventilate the wards or porches. It has a capacity of eighteen patients at an estimated cost of $4,400.



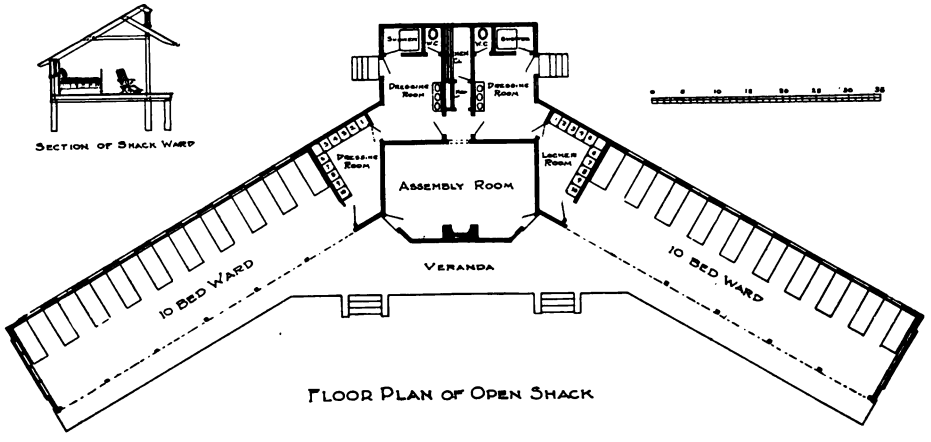
No. 85.—Municipal Sanatorium, Otisville, N. Y. DESIGNED BY DR. HERMANN M. BIGGS. JOHN B. VAN PELT, ARCHITECT. LEAN-TO. VIEW OF FRONT ELEVATION, AND FLOOR PLAN. CAPACITY, 18 PATIENTS. ESTIMATED COST, $4,400. (See illustrations 14, 28, 59, 60, 94 and 101 for further description of this institution.)



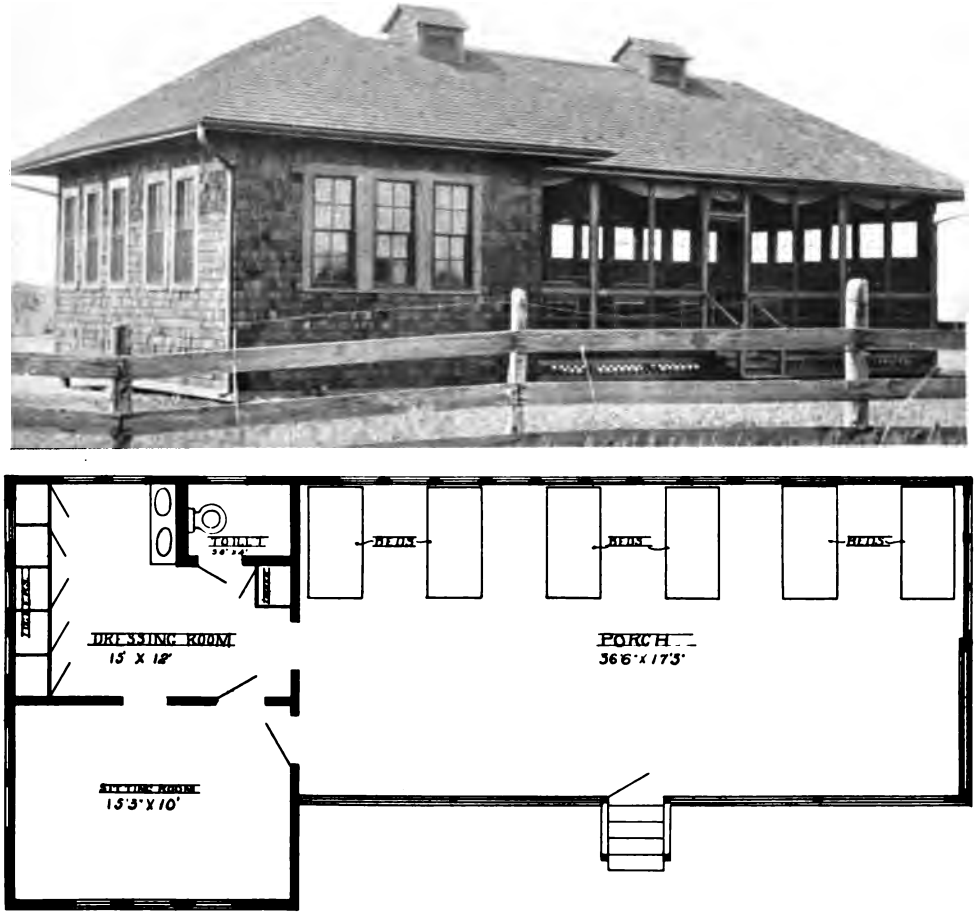
No. 86.—Association Sanatorium, Louisville, Ky. D. X. Murphy & Brother, Architects. Lean-to. View of Front Elevation and Floor Plan. Capacity, 12 Patients. Estimated Cost, $2,750. (See illustration 99 for further description of this institution.)

Association Sanatorium, Louisville, Ky., Lean-to for Women (Illustration 86). This building is 56 feet long by 36 feet wide including the porches, is of frame construction, placed on oak posts, and stands on a steep hillside. It consists of a central sitting room 16 feet wide by 16 feet deep, with a dressing room in its rear 16 feet wide by 12 feet deep, containing bath and toilets. On each side of this section is a dormitory 19 feet wide by 16 feet deep. The building is illustrated to show the interesting arrangement of its porches. On the south is one running along the entire front of the building, 9 feet wide by 56 feet long, and on the north are two each 9 feet wide by 19 feet long, one on either side of the dressing rooms. This plan supplies porches with a southern exposure for winter use, and a northern exposure when the weather is too warm for comfort in summer. The capacity of the building is twelve patients and it cost $2,750.

North Reading State Sanatorium, North Reading, Mass., THE LEAN-TO (Illustration 87). This building is of frame construction, placed on stone piers, covered on the exterior and roofed with shingles. It is one hundred and thirty-six feet along the front, and is designed so that both the porches can be overlooked from the sitting room. The length of the wings is fifty-eight feet on the front and sixty-seven feet on the rear and the width nineteen feet including the veranda. The central section is sealed on the interior and the porches are left unfinished. The locker rooms are placed at the inner ends of the porches so as to utilize the space of the angles made where the wings join the centre apartment. The sitting room is 24 feet wide by 18 feet deep and the two dressing rooms are both 10 feet wide by 18 feet deep, and contain shower baths, toilets and wash-basins. The roof of the porch has a break on the front for ventilation purposes, somewhat like that in the roof of the lean-to at Otisville (illustration 85). The veranda in front of the sleeping porches also extends in front of the sitting room, and is a feature to be noted, as it adds materially to the floor space which can be used in good weather. There are four of these lean-tos, all alike, put up in connection with other buildings for one of the new sanatoria built by the State Commission in Massachusetts. They are very satisfactory except for the rear walls of the porches which are said to be rather low. Their capacity is twenty patients and they cost $3,500 each.

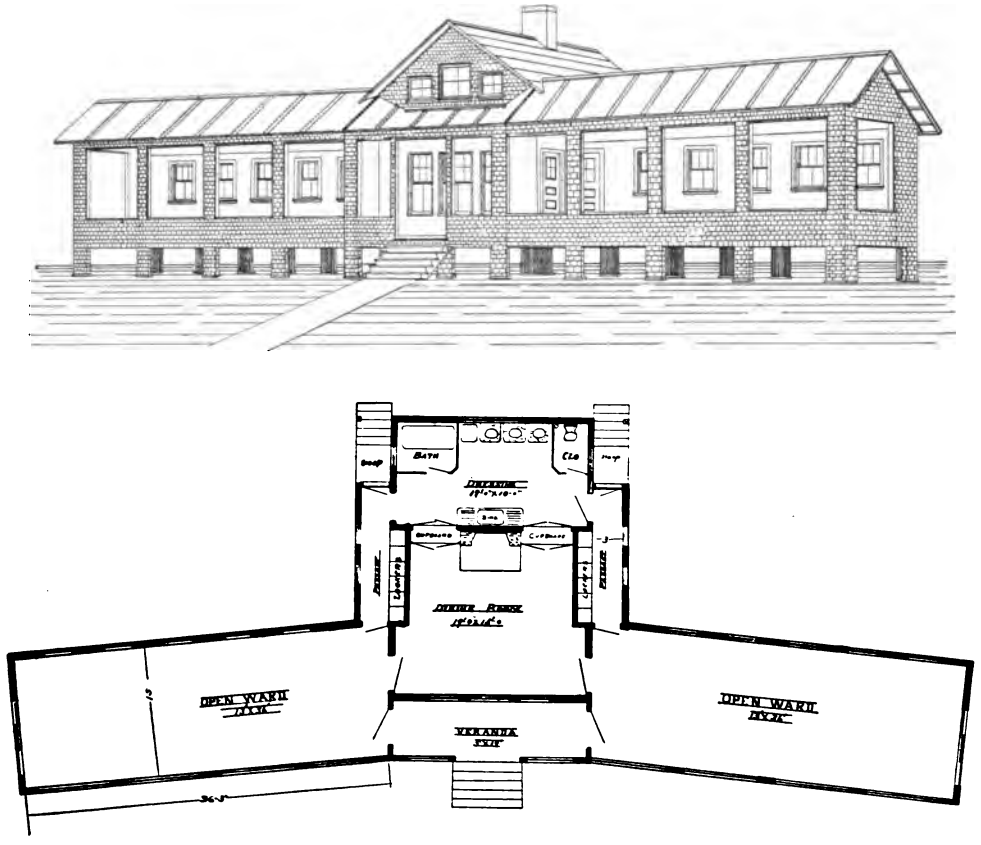


No. 87.—North Reading State Sanatorium, North Reading, Mass. JOHN A. FOX, ARCHITECT.
LEAN-TO. VIEW OF FRONT ELEVATION, FLOOR PLAN AND CROSS-SECTION.
CAPACITY, 20 PATIENTS. COST, $3,500.



No. 88.—Edward Sanatorium, Naperville, Ill. DESIGNED BY DR. THEODORE B. SACHS. W. A. OTIS AND EDWARD H. CLARK, ARCHITECTS. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 6 PATIENTS. COST, $1,287. (See illustrations 62 and 82 for further description of this institution.)

Edward Sanatorium, Naperville, Ill., LEAN-TO (Illustration 88). This building is of frame construction, placed on cedar posts, covered externally and roofed with cedar shingles. It is 52 feet long by 22 feet wide and consists of an enclosed sitting room 15 feet wide by 10 feet deep and dressing room 15 feet wide by 12 feet deep, at one end, from which extends out at a right angle a porch or open ward 36 feet wide by 71 feet deep. The sitting room is plastered and has three large windows breaking up the south wall and two windows and a door leading to the porch. The dressing room is finished in the same manner and contains lockers for each patient, toilets, baths and lavatories. The porch is unfinished, faces the south, has an open front protected in bad weather by canvas curtains, a large door occupying one-half of the east wall, and two large ventilators in the roof. It is illustrated to show the means used to ventilate the porch; the rear and side walls, with the continuous row of windows and the ventilators in the roof, should be noted. The building has a capacity for six beds and cost $1,287.



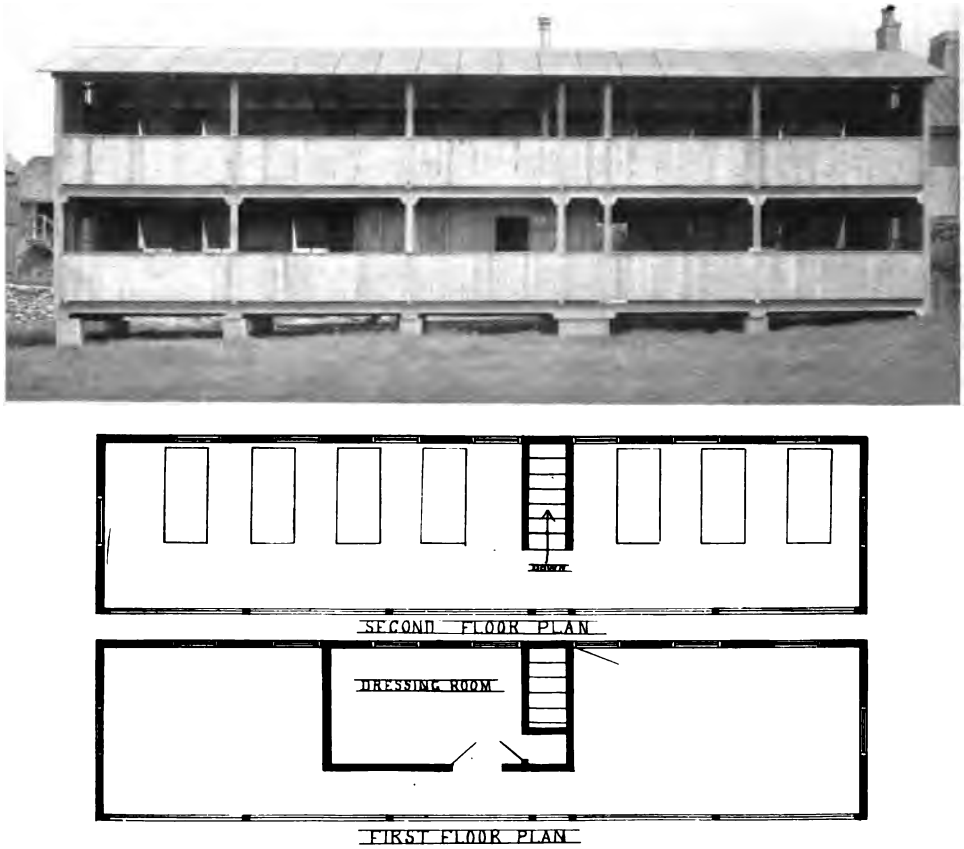
No. 89.—Iowa State Hospital, Mt. Pleasant, Ia. H. F. LIEBBE, ARCHITECT. LEAN-TO. FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 12 PATIENTS. ESTIMATED COST, $3,000.

Iowa State Hospital, Mount Pleasant, Ia., LEAN-TO (Illustration 89). This building is planned on the lines of a lean-to, with two wards on either side of a central section which projects to the rear. It is a one story building of frame construction. The interior walls are sealed with yellow pine and finished in oil. The exterior is covered with cedar shingles stained dark brown and trimmed with an ivory color.

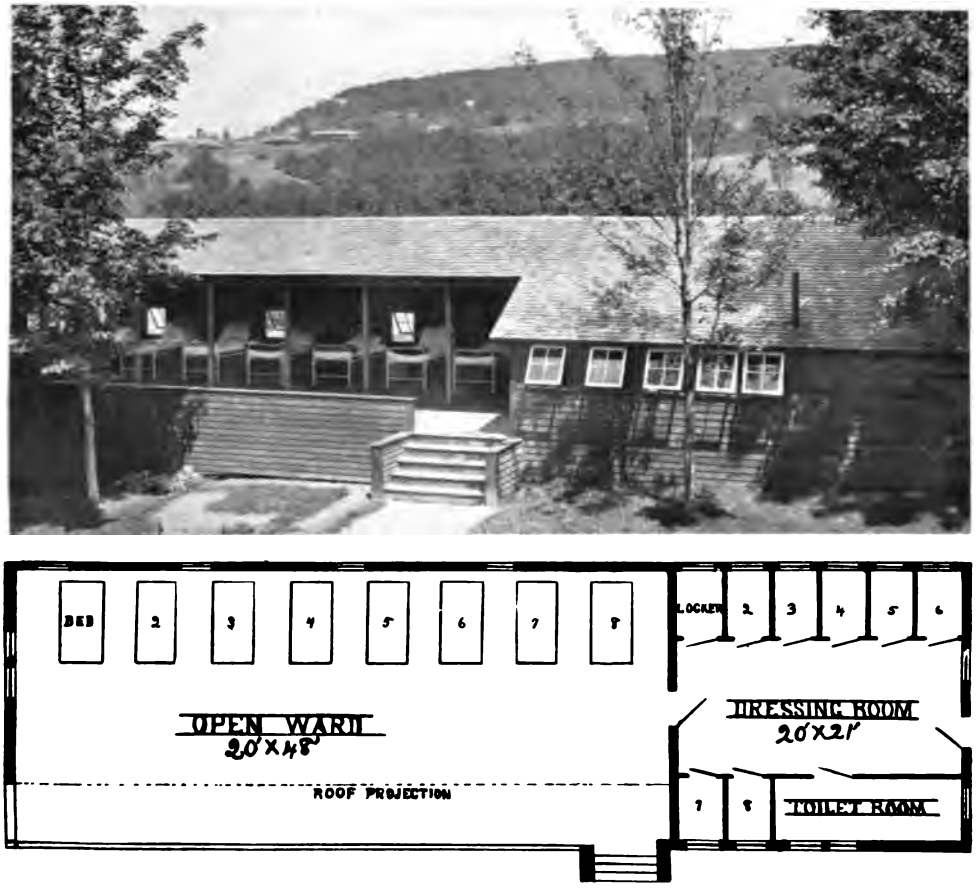
In the centre of the building is a room 15 feet wide by 19 feet deep, used both as a sitting and dining room, and extending out from each side of it is a porch or open ward 37 feet long by 14 feet wide for six patients. From the wards, on the sides of the central room, are passageways 4 feet 6 inches wide by 13 feet long, running back to the dressing room, which is 10 feet wide by 19 feet long, and contains a bath tub, three wash-bowls, a toilet and a slop sink. On the inner sides of both halls are lockers for each patient. The entire front of the building is open, but fitted between the pillars with sliding sash and glass windows and frames for screens. The rear walls of the wards also have windows between each bed in order to produce cross-ventilation. The rear extension is 20 feet deep by 30 feet wide, well lighted by windows at every available point, with a cellar excavated under it, containing a hot water heating plant. In the central room is a brick fire-place and an electric oven for reheating the food sent in from the service building, before it is served to the patients. It also has windows on the front above the porch giving sunlight to the

room and ventilation near the ceiling. The cost of the building complete, constructed to house twelve patients, was $3,000, but the capacity can be enlarged at small expense if desired, by adding rooms at the end of each ward. Attention should be called to the situation of the combination sitting and dining room, the placing of the lockers in halls on its sides and the porch space in front of the central room, used as a vestibule to the wards, as it is a new arrangement of a floor plan for the lean-to type of building.

Rush Hospital, Country Branch, Malvern, Pa., LEAN-TO (Illustration 90). This is a frame building of very cheap construction, placed on concrete piers, and covered by a composition roofing. It is two stories high, 53 feet long by 12 feet deep, with a small portion of the first floor, 7 feet wide by 18 feet long, enclosed for a dressing room and containing lockers, lavatories and toilets. The balance of the ground floor is used by patients for a lounging and sitting room. The second floor is an open ward housing the beds. The front of the building on both stories is boarded up from the floor four feet, and cross-ventilation is obtained by windows in the rear wall. This structure is practically a two story shed facing the south and is one of the cheapest methods of housing tuberculous patients. It has a capacity of seven beds at an estimated cost of $400.



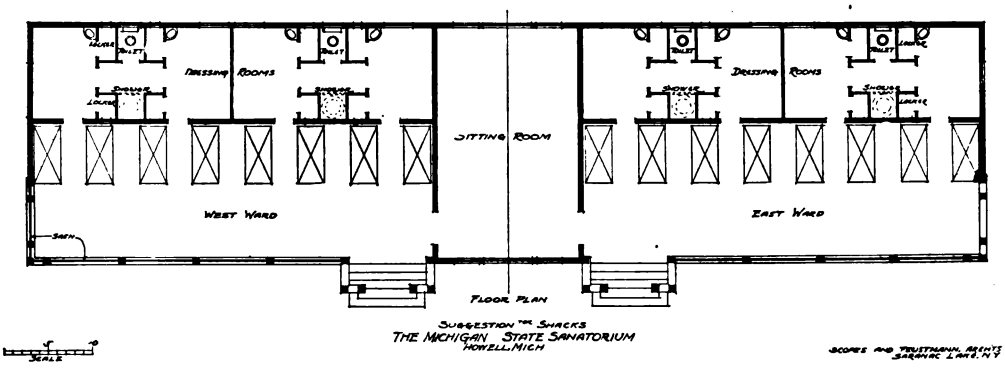
No. 90.—Rush Hospital, Country Branch, Malvern, Pa. BROOKIE & HASTINGS, ARCHITECTS. LEAN-TO. VIEW OF FRONT ELEVATION AND FLOOR PLANS. CAPACITY, 7 PATIENTS. ESTIMATED COST, $400. (See illustration 97 for further description of this institution.)



No. 91.—Loomis Sanatorium, Liberty, N. Y. Designed by Dr. Herbert Maxon King. Lean-to. View of Front Elevation and Floor Plan. Capacity, 8 Patients. Estimated Cost, $1,000. (See illustrations 1, 72, 73 and 108 for further description of this institution.)

Loomis Sanatorium, Liberty, N. Y., Lean-to (Illustration 91). This building is of frame construction, placed on stone piers, covered externally with siding and has a shingled roof. It is Dr. King's latest modification of a lean-to building and is 70 feet long by 20 feet wide, divided into an open porch 20 feet wide by 48 feet long at one end, and an enclosed apartment 20 feet wide by 21 feet long at the other. There are lockers or small private dressing rooms 3 feet wide by 5 feet deep, for each patient, toilets, baths, and a central dressing hall between the rows of lockers. The enclosed apartment is heated by a large coal stove with boiler attachment to supply hot water for toilet purposes. It has a capacity for eight patients at an estimated cost of $2,000.

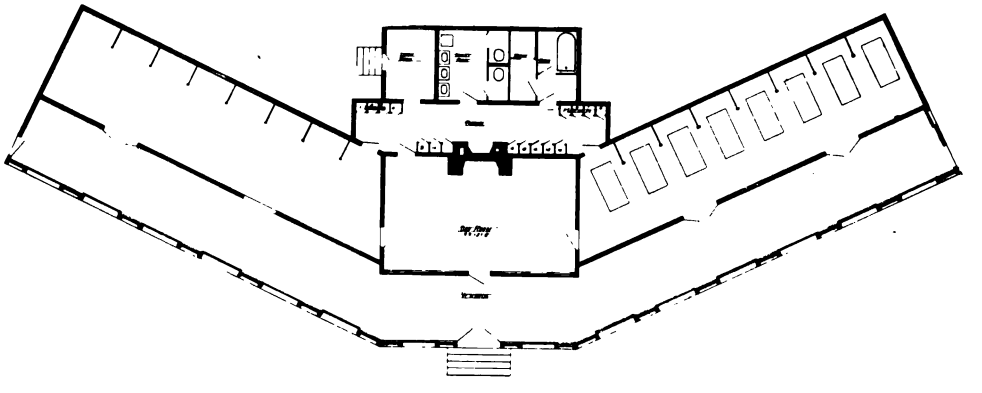
Michigan State Sanatorium, Howell, Mich., Lean-to, Floor Plan (Illustration 92). This was a design made for a lean-to at the Michigan State Sanatorium, but has not been constructed. The building was to have been of frame, 100 feet long by 25 feet deep, with sitting room 15 feet wide by 25 feet deep in the centre, the porches to be 42 feet long by 24 feet deep, divided into an open ward with four dressing rooms in its rear; these rooms to be for two patients each, 8 feet wide by 10 feet deep, fitted with lockers, showers, toilets



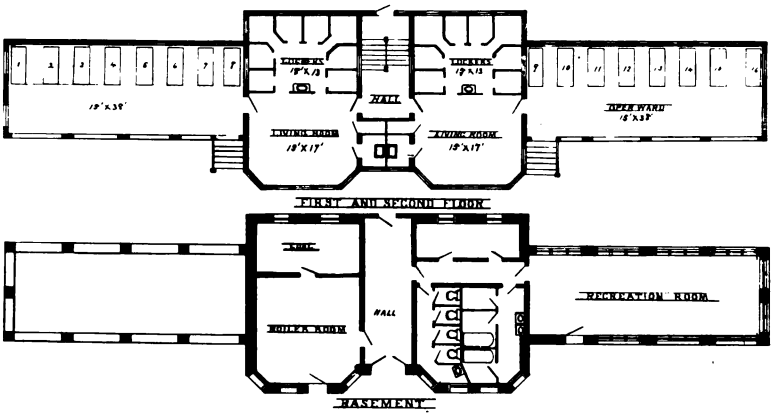
No. 82.—Michigan State Sanatorium, Howell, Mich. SCOPES & FEUSTMANN, ARCHITECTS. DESIGN FOR A LEAN-TO. FLOOR PLAN. CAPACITY, 16 PATIENTS. ESTIMATED COST, $3,500. (See illustration 74 for further description of this insitution.)

and wash-basins and heated from a central plant. The design is worth studying and would make a convenient building for a site on a side hill as there is no rear extension in the plan. The capacity is sixteen patients at an estimated cost of $3,500.

New York State Hospital, Raybrook, N. Y., LEAN-TO FOR WOMEN (Illustration 93). This floor plan was designed for a lean-to at Raybrook, but has not yet been erected. It is to be constructed either of brick or frame and will consist of a central section, two wings and a rear extension. In order to make the dressing rooms in the rear extension more accessible for the patients in the wards, the wings are designed to form an acute angle in the rear of the building, at their junction with the central section. The wards are fifty-four feet long on the front, forty-six feet long on the rear and thirteen feet wide opening on to a veranda nine feet wide which extends along the entire front of the building. The central sitting room is 27 feet wide by 11 feet deep and has a large, open fire-place. Behind it is a rear extension 28 feet wide by 18 feet deep, divided into a linen room, toilet room, bathroom, dressing and locker room. The plan should be noted for the arrangements made in the wards to protect the head of the beds, by a half partition which extends about three feet in the wards. The building has a capacity for sixteen patients and will cost about $3,500.

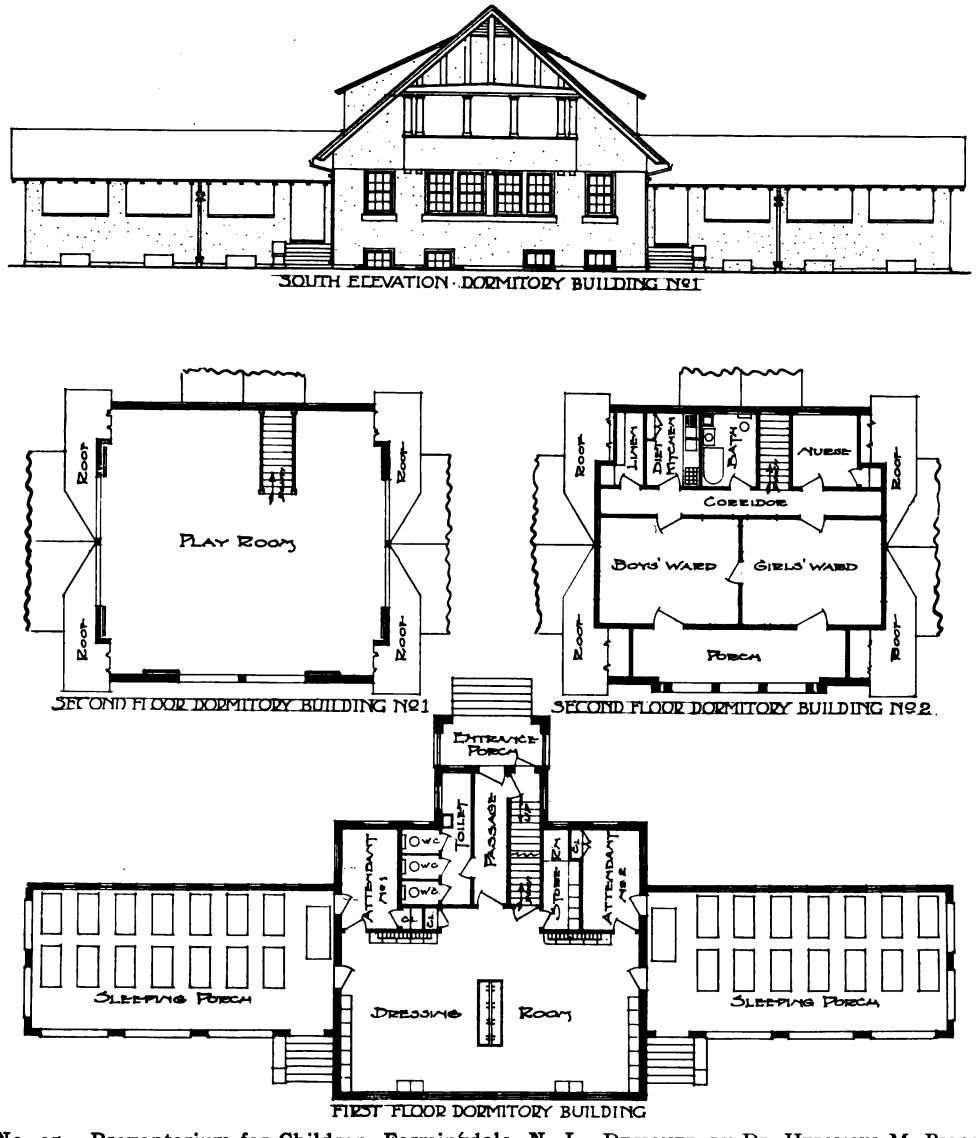


No. 93.—New York State Hospital, Raybrook, N. Y. FRANKLIN B. WARE, ARCHITECT. DESIGN FOR A LEAN-TO. FLOOR PLAN. CAPACITY, 16 PATIENTS. ESTIMATED COST, $3,500.



No. 94.—Municipal Sanatorium, Otisville, N. Y. Designed by Dr. Hermann M. Biggs. James D. Burt, Architect. Lean-to, No. 103. View of Front Elevation and Floor Plans. The Special Feature of this Building is an Arrangement that Forms the Patients into Groups or Units by Supplying a Separate Living Room and Toilet Apartment in Connection with Each Porch. Capacity, 32 Patients. Cost. $9,000. (See Illustrations 14, 28, 59, 60, 85 and 101 for further description of this institution.)

Municipal Sanatorium, Otisville, N. Y. Lean-to, No. 103. (Illustration 94.) This is a two story building, with foundations of native stone, eighteen inches thick. The walls are of frame construction, covered on the outside with shingles, stained a dark green and trimmed white. The roof is also of shingles stained red. The interior is ceiled with matched and fitted boards, and the floors are of wood, all finished in oil. The plan of the building follows the general lines of the lean-to, but its special feature is an arrangement that forms the patients into groups or units by supplying a separate living room and toilet apartment in connection with each porch. All the patients have private dressing rooms built with low partitions, and provided with lock doors. The basement contains the heating apparatus, toilets, baths, blanket store rooms, and a recreation room which is almost above the ground. Over the centre is an attic divided into rooms which can be locked and are fitted with open shelves where trunks, dress-suit cases and other belongings of the patients can be stored. Each wing is provided with a fire escape in the rear. The open front faces the south, and is furnished with roll curtains for protection in rough weather. This building has a capacity of thirty-two patients, in four groups of eight persons to each porch and cost about $9,000.



No. 95.—Preventorium for Children, Farmingdale, N. J. DESIGNED BY DR. HERMANN M. BIGGS. SCOPES & FEUSTMANN, AND WALTER W. JUDELL, ASSOCIATED ARCHITECTS. LEAN-TO. FRONT ELEVATION AND FLOOR PLANS. CAPACITY, 28 CHILDREN AND TWO ATTENDANTS. ESTIMATED COST, $7,700. (See illustrations 12, 19 and 27 for further description of this institution.)

The Preventorium for Children, Farmingdale, N. J., DORMITORY BUILDING (Illustration 95). Modified from the design of the shack for children at Municipal Sanatorium at Otisville. The exterior walls of these pavilions are constructed of hollow tile, covered with cement stucco, and are placed on a concrete foundation and concrete piers. The interiors are of frame construction, with floors of edge-grain yellow pine, and the roofs are covered with shingles. There are four of these buildings, all alike, except the second floors of the central sections. The basements contain bathing facilities, and the wings are arranged as sleeping wards, with open fronts, ceilings eight feet high, and

windows in the rear walls. The dressing rooms in the centre sections are furnished around the walls with benches divided into individual lockers, used to store the toys and personal belongings of the children. Over these benches, at a height of five and one-half feet, are two shelves where the blankets used during the rest hour are placed. On the rear walls are racks to hold toilet articles and in the centre is a stone wash-trough with hot and cold water faucets. Behind the dressing rooms are store rooms fitted with large pigeon-holes used instead of lockers, and the toilets arranged to be entered from the rear direct from the grounds and playrooms without tracking mud through the dressing rooms or wards.

In two pavilions the second stories consist of one large play and school room, which can be entirely opened on three sides, and accommodates fifty-six children.

In the other buildings the second stories are used as infirmaries, divided into two wards for four children each, with a porch on the south to which the beds can be wheeled, a nurses' room, a bath, a diet kitchen and a linen room. The pavilions have a capacity for twenty-eight patients each, and cost $7,700.

SECTION VI

Patients' Quarters—Cottage Type of Building

SECTION VI

Patients' Quarters—Cottage Type of Building

Origin of the Cottage

In most of the large private sanatoria it has been found that the lean-to type of building is not satisfactory for housing patients who are willing to pay for good nursing and attendance. Well-to-do patients usually desire separate apartments, and often demand a porch which is private and cannot be overlooked by other inmates of the institution. In this section will be found descriptions of cottages which have proven satisfactory, arranged to house from one to eight patients, with a private room, separate porch, and all modern toilet facilities for each; also cottages designed to be used as a separate unit to accommodate families where one or more members are tuberculous, and having rooms for a private nurse and servants. Cottages planned for the use of one person only, usually have but two rooms, one for dressing and toilet purposes and the other practically an open sleeping and living porch. This type of cottage is generally a modification of the original structure designed by Dr. Millet and can be built for a reasonable figure.

It is reported that in many instances patients at large public institutions are more contented and improve faster when given a separate room or a share in a small building with one or more congenial associates, and as some of the cottages described are very inexpensive a more careful study of the results obtained by the different methods of housing incipient patients, may in the future cause the construction of a larger proportion of the cottage type of sanatorium in the place of ward buildings, for state and county tuberculosis hospitals.

Planning Cottage

In designing and constructing cottages the following points should be considered.

First: Each patient should have a private room and a porch which, when desired, can be screened in a way to prevent it being overlooked.

Second: Cottages should be designed when possible to conform to the desires and customs of the people who will use them.

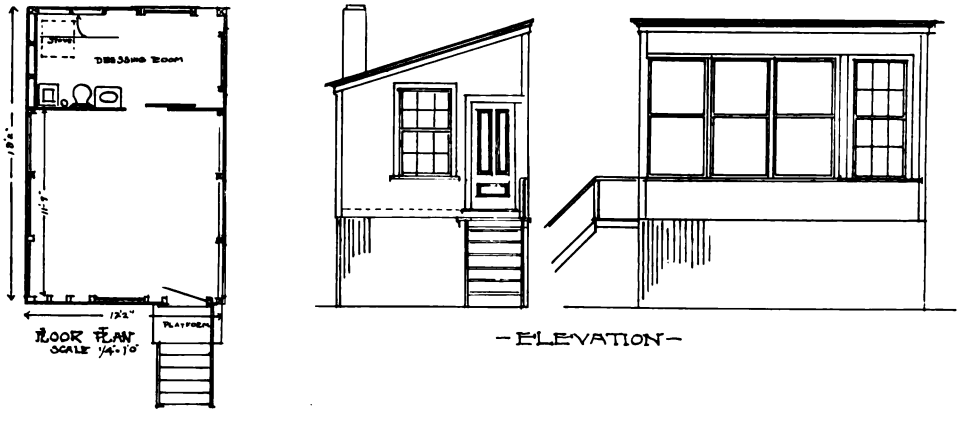
Third: The buildings should be constructed of such material as will make them comfortable at all seasons of the year in the climate for which they are intended.

Fourth: The interior should be finished in the most simple manner and with smooth surfaces in order to eliminate places likely to collect dust.

Fifth: The sleeping apartment should be as much like an open porch as possible, or ventilated in a manner that can be regulated by an attendant, but will prevent the patient from shutting off the current of air.

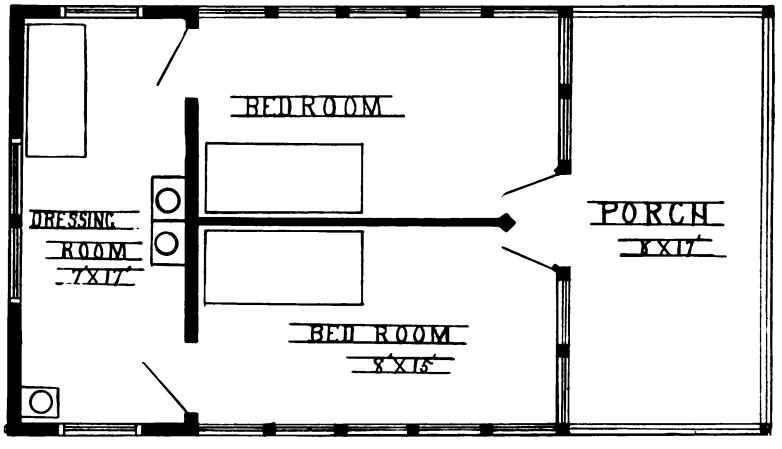
EXAMPLES OF COTTAGES

The Millet Sanatorium, East Bridgewater, Mass., COTTAGE (Illustration 96). This is a frame building supported on cedar posts, boarded and covered with shingles.



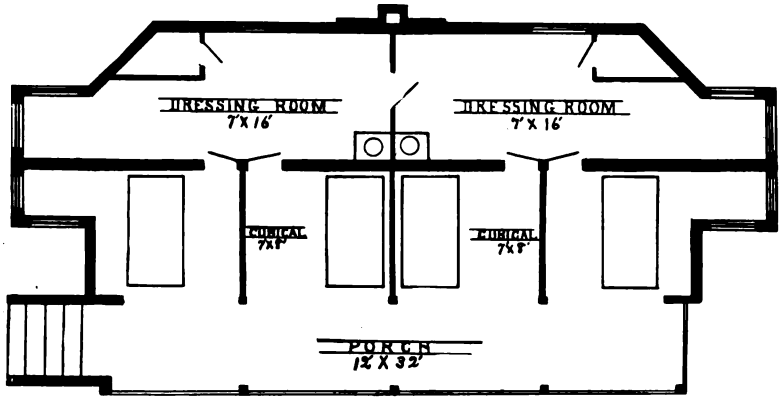
No. 96.—Millet Sanatorium, East Bridgewater, Mass. Design by Dr. C. S. Millet. Cottage. View of Front Elevation, Floor Plan, Side and End Elevation. Capacity, 1 Patient. Estimated Cost, $200.

The roof is laid at "quarter pitch" with the rise to the front. There is no plastering or other interior finish, but the floor is laid double with the upper layer of narrow, hard pine. The cottage is 12 feet wide by 18 feet long, divided by a partition into a bedroom 12 feet wide by 12 feet long, open on all sides, and a dressing room 6 feet wide by 12 feet long, lighted by two windows, heated by a stove and furnished with a stationary wash-stand, running water, a toilet and a wardrobe. The rear wall is six and one-half feet high, and faces the north and can be opened or closed by wooden shutters. The building is intended for one person and cost about $200.00.



No. 97.—Rush Hospital, Country Branch, Malvern, Pa. BROOKIE & HASTINGS, ARCHITECTS. COTTAGE. VIEW OF FRONT AND SIDE ELEVATIONS, AND FLOOR PLAN. CAPACITY, 2 PATIENTS. ESTIMATED COST, $400.

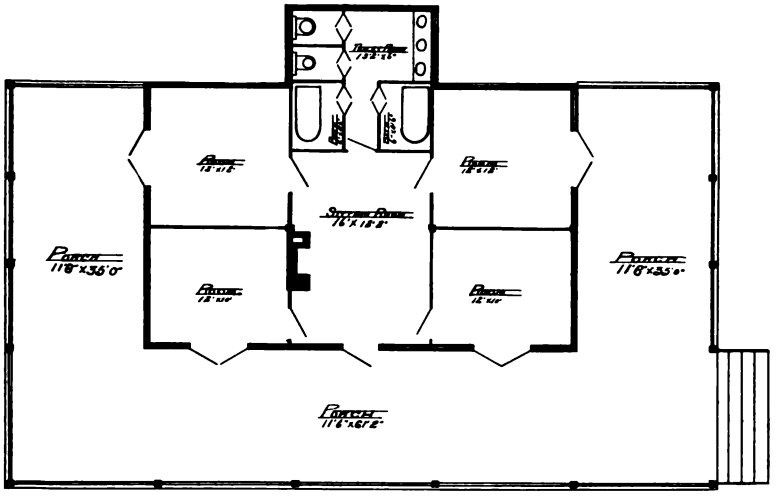
Rush Hospital, Country Branch, Malvern, Pa., COTTAGE (Illustration 97). This is a small frame building placed on 4 x 4 timber posts and roofed with patent roofing paper. It is 18 feet wide by 24 feet long and has a porch eight feet wide at one end. The building is divided into two bedrooms, each 8 feet wide by 15 feet long, and a dressing room 16 feet wide by 7 feet deep. The bedrooms can be thrown into one large room by removing the portable partition between them. The arrangement of the windows for throwing open the interior should be noted. This little building is well designed for cheap and simple housing. The capacity is two patients and estimated cost of construction $300.00.



No. 98.—Adirondack Cottage Sanitarium, Saranac Lake, N. Y. COTTAGE. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 4 PATIENTS. ESTIMATED COST, $400.

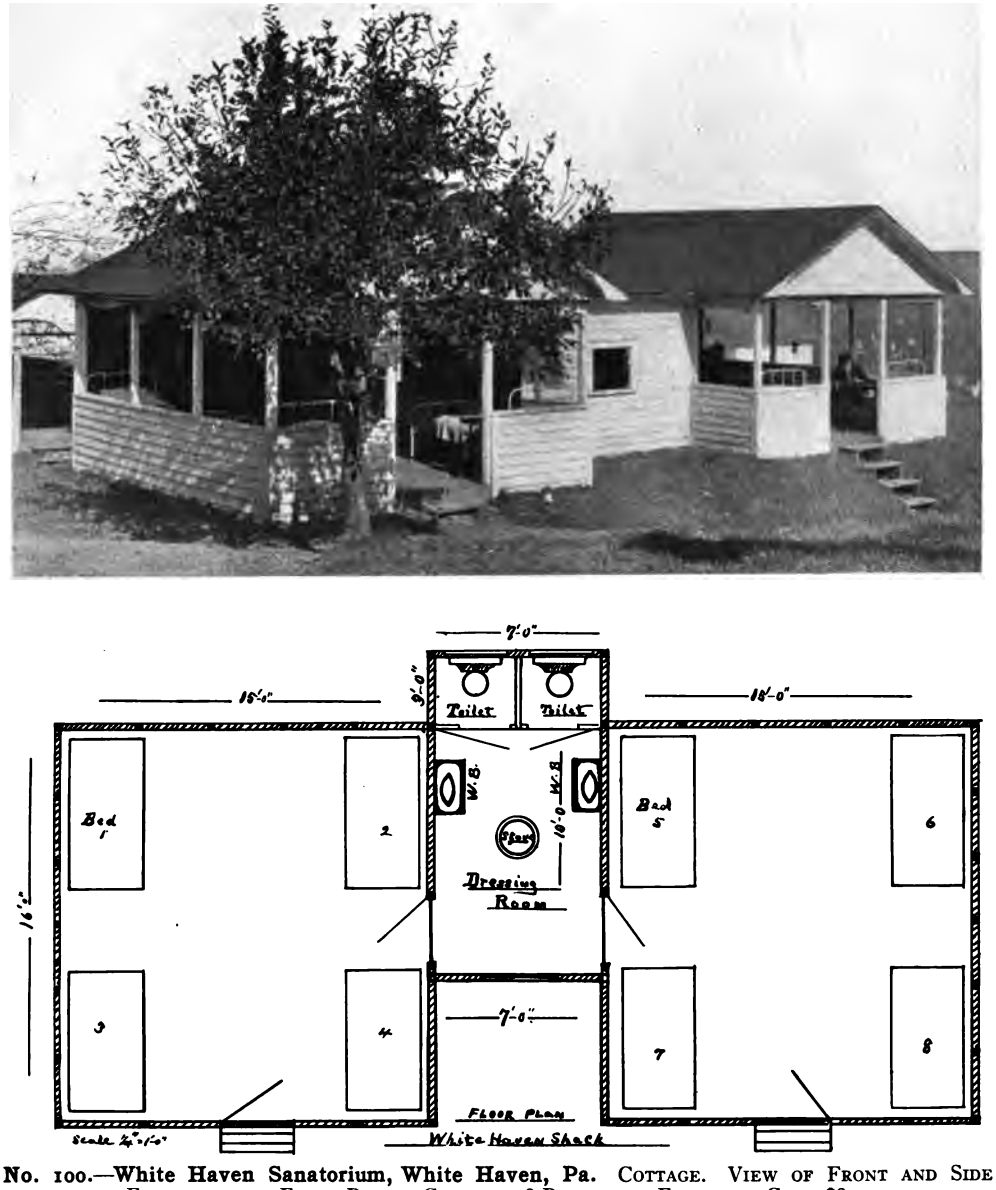
Adirondack Cottage Sanitarium, Saranac Lake, N. Y. (Illustration 98). This building is placed on stone piers and is of frame construction, 33 feet wide by 19 feet deep. It was built of second-hand lumber and other material obtained from older buildings which had been torn down and was one of the first experiments in shack construction at this Sanitarium. As the patients at this institution are given as much privacy as possible, the porch is divided into small cubicles, and the partitions between the patients' beds are erected to a height of six feet.

The dressing room is heated by a stove, but the toilet facilities are provided in another building. It has a capacity of four patients at an estimated cost of $400.00.



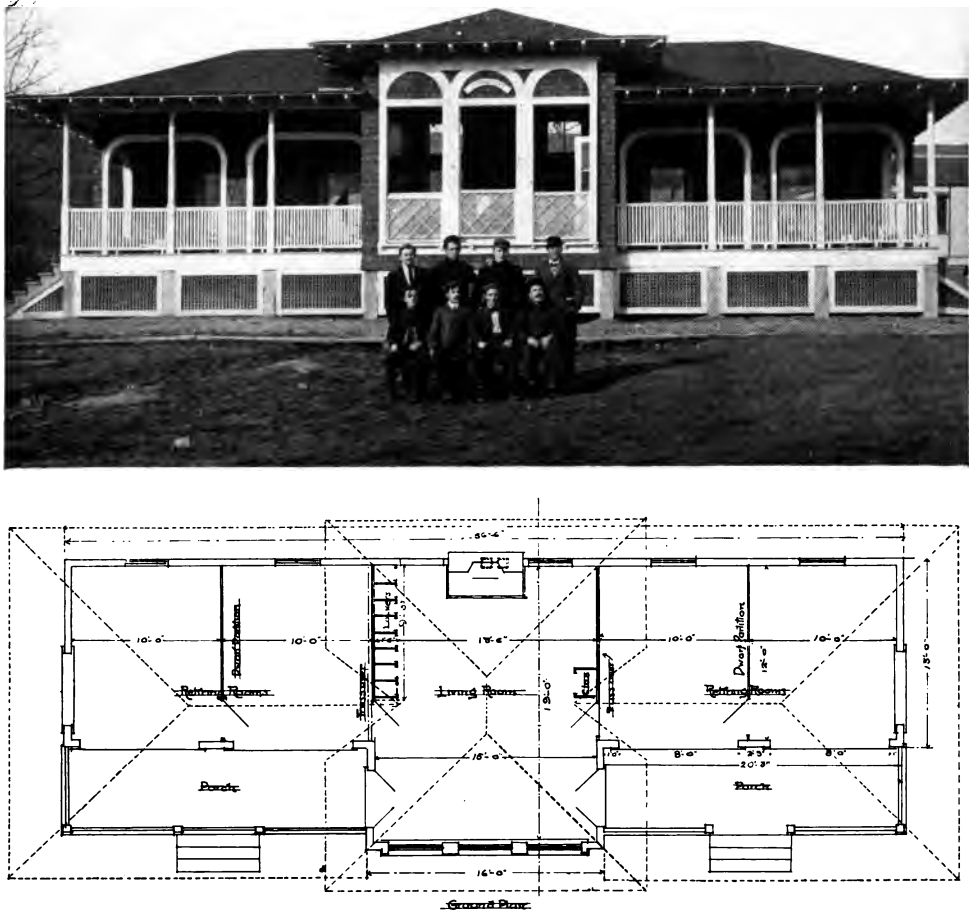
No. 99.—Association Sanatorium, Louisville, Ky. D. X. MURPHY & BROTHER, ARCHITECTS. COTTAGE. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 12 PATIENTS. ESTIMATED COST, $2,250.

Association Sanatorium, Louisville, Ky., MEN'S COTTAGE (Illustration 99). This is a frame cottage on concrete piers, covered with a patent roofing, 36 feet wide by 22 feet deep, without the porch or the extension. It consists of a central sitting room 10 feet wide by 15 feet long, and four private rooms, two 10 feet wide by 12 feet deep and two 12 feet wide by 14 feet deep. The toilets and lavatories are in the rear extension, which is 13 feet wide by 7 feet deep, and the building is surrounded on three sides by a porch twelve feet wide. The floor plan of this building is very much like the cottages at the Iowa State Sanatorium, and for some purposes is an improvement over them because of the private rooms. It has a capacity for twelve patients and cost $2,250.



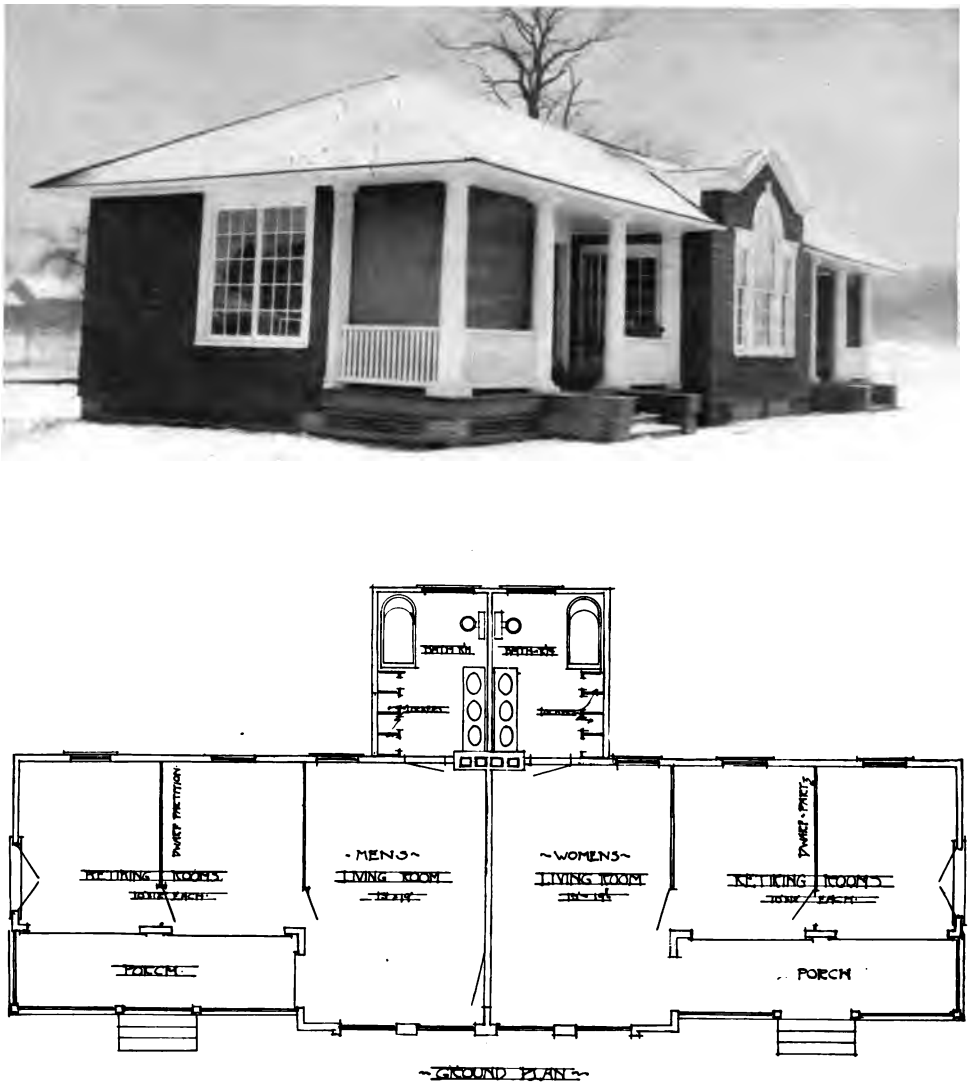
No. 100.—White Haven Sanatorium, White Haven, Pa. COTTAGE. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 8 PATIENTS. ESTIMATED COST, $800.

The White Haven Sanatorium, White Haven, Pa., COTTAGE (Illustration 100). This building, placed on wooden posts, is of a cheap frame construction, covered externally with siding and roofed with composition roofing. There are two open air rooms 15 feet wide by 16 feet long, protected by glass and sash windows in winter and canvas curtains in summer, both hung from the top. The two pavilions house eight patients and are connected by a dressing room 7 feet wide by 10 feet long, which is heated by a small stove and used in common by all. This plan for a cottage may be constructed to house only one or two patients in each pavilion, when all the dimensions except the size of the dressing room should be cut down. The estimated cost is $800.00.



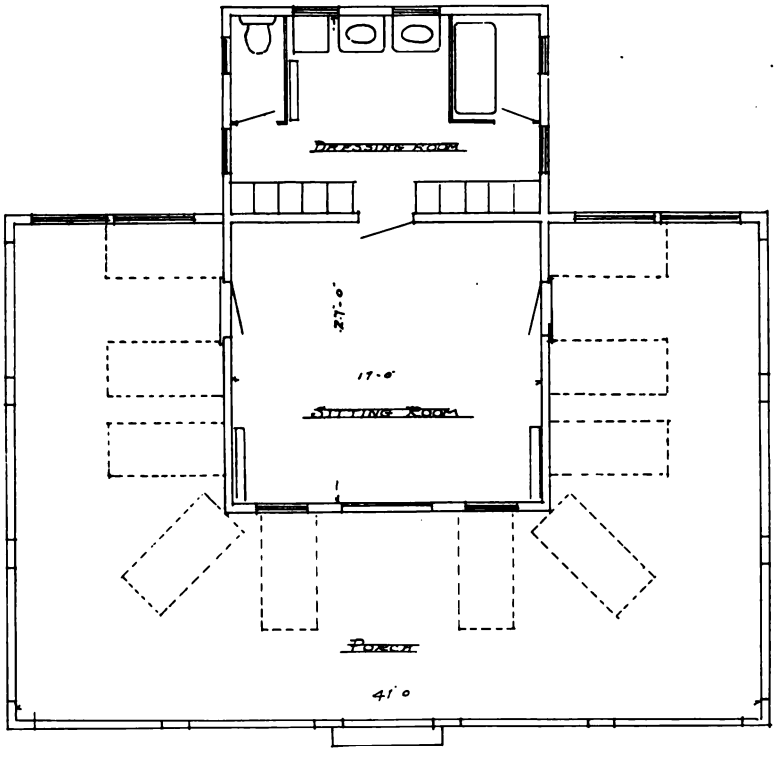
No. 101.—Municipal Sanatorium, Otisville, N. Y. DESIGNED BY DR. HERMANN M. BIGGS. COTTAGE. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 8 PATIENTS. ESTIMATED COST, $1,500.

The Municipal Sanatorium, Otisville, N. Y., COTTAGE (Illustration 101). This is a frame building on brick piers, covered with shingles artistically stained and trimmed and has a very attractive appearance. It is 58 feet long by 19 feet wide with a sitting room in the centre 15 feet wide by 19 feet deep, which contains the patients' lockers and a fireplace. The porches, 20 feet wide by 19 feet deep, are divided by a partition eight feet high, into two rooms 10 feet wide by 12 feet deep, for two patients each. The verandas in front of the porch rooms are six feet wide. There are no toilets, baths or dressing room, as this cottage is used in connection with another building containing a central toilet and washroom. As it is a cheaply constructed building with a floor plan easy to remodel it may be used by small communities who wish to add a pavilion to their local hospital for housing tuberculous patients. The estimated cost is $1200.00.



No. 102.—Plainfield General Hospital, Plainfield, N. J. A. L. C. Marsh, Architect. Cottage Ward for Tuberculous Patients. View of Front and Side Elevation, Floor Plan. Capacity, 8 Patients. Estimated Cost, $3,000. Note.—This is a Modified Plan, of the Municipal Sanatorium Cottage.

Plainfield General Hospital, Plainfield, N. J., Cottage Ward for Tuberculous Patients (Illustration 102). This building is a design modified from the plans of the Otisville Cottage. It is sixty-eight feet long, of frame construction, covered with shingles and placed on stone piers. There is a solid partition running directly through the centre dividing the two sides of the building into two separate sections, making two sitting rooms 13 feet wide by 19 feet long on the front, and two dressing rooms 8 feet wide by 12 feet long in the rear. The elevation has a slightly different arrangement for the windows in the centre of the building and is supported by large round columns which gives it a very attractive appearance. The capacity is eight patients at an estimated cost of $3,000.



No. 103.—Iowa State Sanatorium, Oakdale, Ia. DESIGN BY DR. H. E. KIRSCHNER. H. F. LIEBBE, ARCHITECT. COTTAGE. VIEW OF FRONT AND SIDE ELEVATION AND FLOOR PLAN. CAPACITY, 8 PATIENTS. ESTIMATED COST, $1,500. (See illustrations 24, 29 and 84 for further description of this institution.)

Iowa State Sanatorium, Oakdale, Ia., COTTAGE (Illustration 103). This cottage, placed on brick piers, is of frame construction with a shingle roof. It consists of a large central sitting room 17 feet wide by 15 feet deep, about which is built a twelve foot wide porch. In the rear is a dressing room 17 feet wide by 9 feet deep, containing lockers and toilet facilities, which receives plenty of sunlight as it is not enclosed by the porch. The building was planned for ten patients but is more comfortable when only housing eight. It is claimed for this structure that part of the porch will always be sheltered from storms and will receive sunlight from some direction during the entire day. Those who have used the design speak very highly of the arrangement, as there is room for all the beds on the sheltered side, and it is not necessary to enclose a portion of the porch as is done where there is only one exposure.

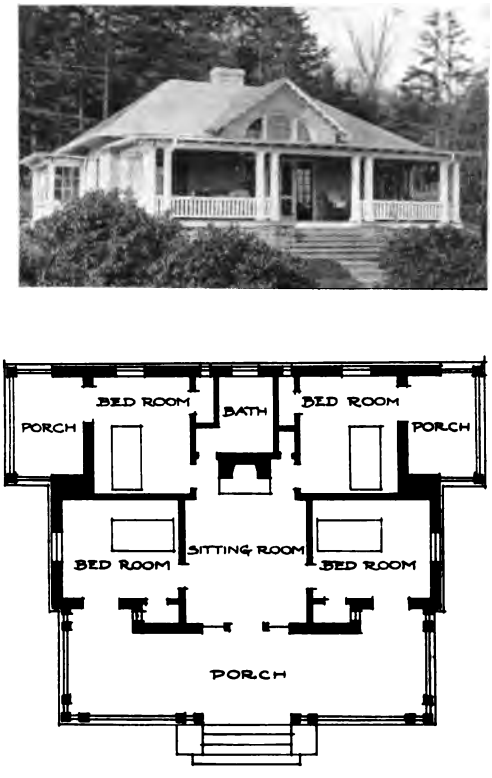
Larger lockers should be placed in the dressing room and better toilet facilities provided, such as a shower bath and extra toilets. At the Iowa State Sanatorium this cottage has been very satisfactory and ten of a like design have been erected at a cost of about $1,400 each.

Adirondack Cottage Sanitarium, Saranac Lake, N. Y., WHEELER COTTAGE (Illustration 104).

This cottage is placed on a foundation of native stone and is of frame construction, covered with a four inch brick veneer externally, leaving an air space 1 inch wide between the brick and the sheathing.

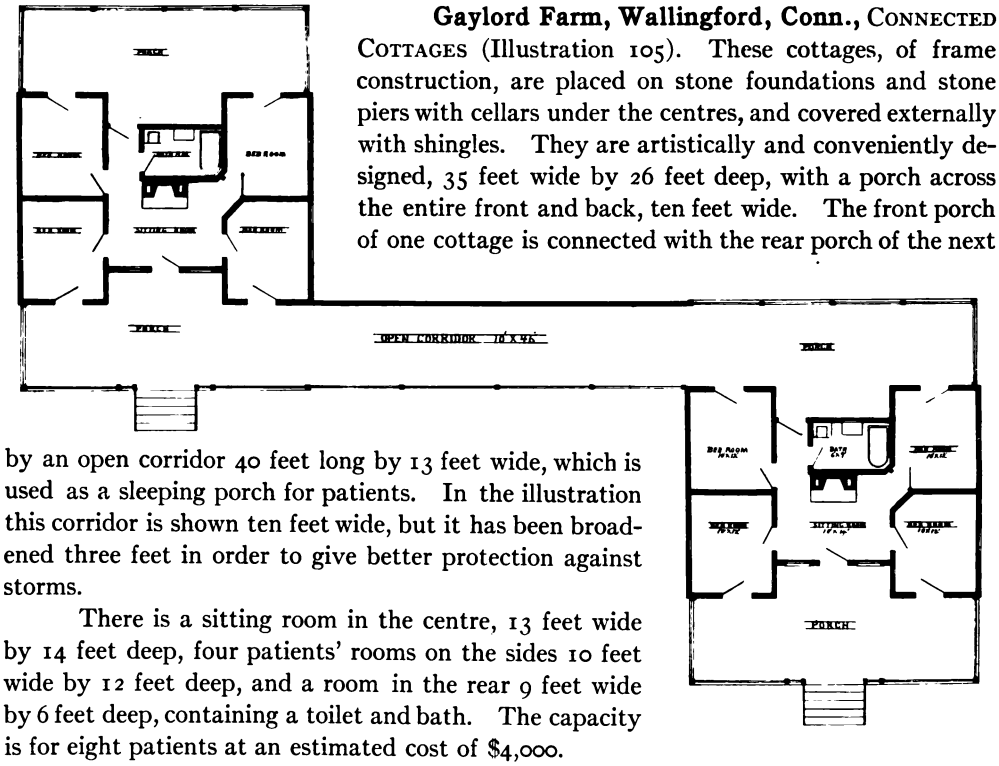
This method of construction was adopted in order to make a warm, dry building, and to save repairs and paint on the exterior. The roof is of blocked tin. On the interior walls and ceilings are finished in plaster on wood lath with hard wood trimming, hard wood floors and coved bases with flush joints.

Everything in this building has been arranged in a compact form. There is direct sunlight in the sleeping rooms, which are small, but contain a closet, ventilators and are connected with a private porch for each patient. The cottage consists of only one story, but has a cellar under the entire building which contains a hot water heating apparatus. It has a capacity for four patients and cost $4,000.



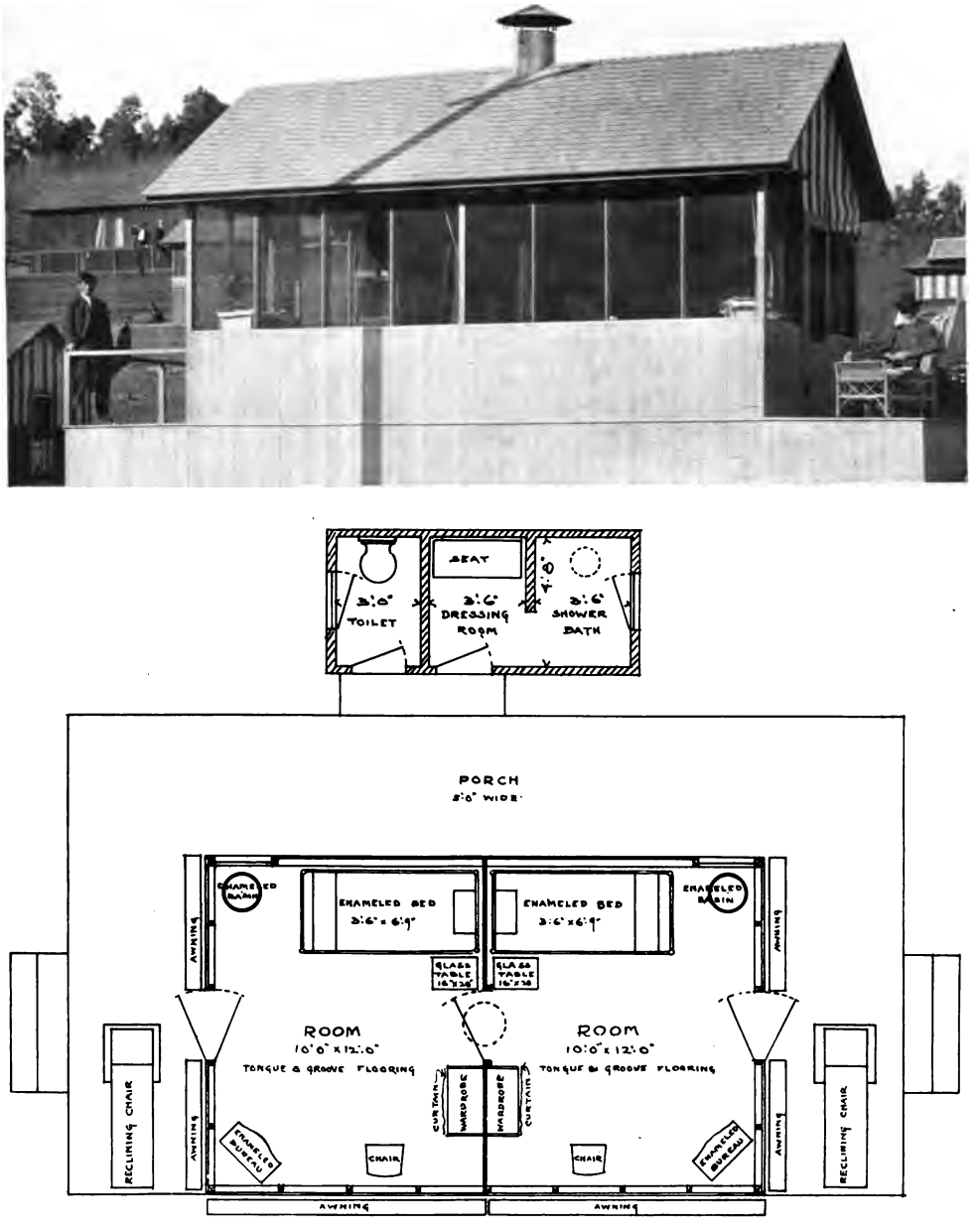
No. 104.—Adirondack Cottage Sanitarium, Saranac Lake, N. Y. SCOPES & FEUSTMANN, ARCHITECTS. WHEELER COTTAGE. VIEW OF FRONT ELEVATION AND FLOOR PLAN. CAPACITY, 4 PATIENTS. ESTIMATED COST, $4,000. (See illustrations 63, 98 and 109 for further description of this institution.)

No. 105.—Gaylord Farm, Wallingford, Conn. BROW & VON BEREN, ARCHITECTS. CONNECTED COTTAGES. VIEW OF FRONT AND SIDE ELEVATIONS AND FLOOR PLANS. CAPACITY OF EACH COTTAGE, 8 PATIENTS. ESTIMATED COST, $3,000.



Gaylord Farm, Wallingford, Conn., CONNECTED COTTAGES (Illustration 105). These cottages, of frame construction, are placed on stone foundations and stone piers with cellars under the centres, and covered externally with shingles. They are artistically and conveniently designed, 35 feet wide by 26 feet deep, with a porch across the entire front and back, ten feet wide. The front porch of one cottage is connected with the rear porch of the next by an open corridor 40 feet long by 13 feet wide, which is used as a sleeping porch for patients. In the illustration this corridor is shown ten feet wide, but it has been broadened three feet in order to give better protection against storms.

There is a sitting room in the centre, 13 feet wide by 14 feet deep, four patients' rooms on the sides 10 feet wide by 12 feet deep, and a room in the rear 9 feet wide by 6 feet deep, containing a toilet and bath. The capacity is for eight patients at an estimated cost of $4,000.



No. 106.—Barlow Sanatorium, Los Angeles, Cal. Designed by Dr. W. Jarvis Barlow. Cottage. View of Front and Side Elevations and Floor Plan. Capacity, 2 Patients. Estimated Cost, $500.

Barlow Sanatorium, Los Angeles, Cal., Cottage (Illustration 106). This building is supported on stone piers and is of frame construction, with a shingle roof, 20 feet wide by 12 feet deep. There is a five foot open porch along the north side and both ends; the outside of the cottage and the porch are painted a seal brown and the shingles of the

No. 107.—Portland Open Air Sanatorium, Portland, Ore. WHIDDEN & LEWIS, ARCHITECTS. COTTAGE. VIEW OF FRONT AND SIDE ELEVATION AND INTERIOR. CAPACITY, 2 PATIENTS. ESTIMATED COST, $1,000. (See illustrations 8 and 16 for further description of this institution.)

roof, green. The interior is finished in surface lumber dressed with oil and varnished, but not ceiled, and is divided into two rooms each 10 feet wide by 12 feet deep. The partition runs transversely from the floor to the roof and is plain, but pierced by a door which may be used if necessary. The north side of the cottage is boarded up but can be opened by a hinged window. Each end and the south side are boarded to a height of three feet from the floor, the space above this to the plate being protected by copper wire screening, and provided with awnings which can be let down in wet weather. The doors, the space between the rafters and three inches under the eaves on each side, left open for ventilation, are screened. On the roof over the partition is an iron ventilator sixteen inches in diameter. The toilet room is placed in a small separate building at the rear and divided into bath, dressing and toilet rooms, well screened and ventilated. This is a good plan where earth closets are used, as they can be emptied without disturbing the patients. Warm water is supplied for toilet purposes by a contrivance operated very successfully in southern California, all the year round by direct sunlight, which is called a "solar heater" and is placed on the roof. The capacity of the cottages is two patients and it cost, including toilet, $700.00.

The Open Air Sanatorium, Portland, Ore., COTTAGE (Illustration 107). This building is placed on stone piers and is of frame construction, externally covered with stained shingles and trimmed with white. It is 16 feet wide by 21 feet deep and has a floor raised two and a half feet above the ground to produce an air space, which is enclosed with lattice work. The interior is divided into an open room 16 feet wide by 13 feet deep, a bath room 4 feet wide by 8 feet long, a little hall and two closets both 4 feet wide by 3 feet deep. It is nicely finished in hard wood and sealed with narrow, selected boards. There is an air space between the ceiling and the roof, in order to prevent the direct rays of the sun heating the interior during the middle of the day. Both the air space under the floor and that above the ceiling should be noted, as they are a necessary part of cottage construction in damp or hot countries. A number of these cottages have been built and are said to be very comfortable, being classed with the more substantial type of open air buildings, as the cost of construction was about $1,000.

Loomis Sanatorium, Liberty, N. Y., THE ORCHARD COTTAGE (Illustration 108). This building is placed on a stone foundation, one story high and of frame construction covered externally and roofed with shingles. The interior is finished in plaster on wooden lath, with hard wood floors and cypress trimmings. It is heated by direct radiation in the rooms, from a hot water boiler placed in the cellar which has been excavated under the entire building. The bedrooms are about 9 feet wide by 10 feet deep, made small intentionally to encourage the patients to live on the porches. The plan is of interest and will please those who believe in utilizing corners and other small places. There is a commodious attic which can be divided into several rooms, a small combined living and drawing room 12 feet wide by 18 feet long, which has a large fireplace, a kitchen 10 feet wide by 11 feet long, a bath and a maid's room. The cottage is more like a pleasant country house than an institutional building and has a capacity for four patients or a small family and can be built at a cost of about $3,500.

Adirondack Cottage Sanitarium, Saranac Lake, N. Y., THE NATHAN COTTAGE (Illustration 109). This building is of frame construction, covered externally with yellow terra-cotta brick veneer placed on native stone foundation. The cottage is about 42 feet wide by 30 feet deep, with a veranda having a southern exposure, and protected by glass and sash frames on the north, east and west, arranged so that its roof does not prevent sunlight from entering the rooms. The sitting room, 14 feet wide by 20 feet deep, is

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